

How does transfer-pricing enforcement affect reported profits?

Molly Saunders-Scott
University of Michigan
mojusaun@umich.edu*

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Abstract

Many governments are concerned that they lose tax revenue from profit shifting by multinational firms, and have stiffened transfer-pricing regulations in response. It is possible and, indeed, likely that these regulations actually reduce tax collections in most countries. The regulations are designed to decrease profit-shifting outflows, but they also may decrease profit-shifting inflows and increase compliance costs for all firms with related-party transactions. While the reduced outflows should increase reported profits, the other two effects, the reduced inflows and the higher compliance costs, reduce reported profits. Data from ORBIS on multinational corporations indicate that, for the average firm, increased regulation reduces the reported profits of the local affiliates of multinational corporations.

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1 Introduction

To maximize after-tax profits, a multinational corporation that has related firms (affiliates) located across a number of countries has an incentive to shift profits from an affiliate that faces a high corporate tax rate to an affiliate that faces a lower corporate tax rate. Manipulating transfer prices is one of the main means by which corporations reallocate profits. When goods and services are transferred between members of the multinational corporation, the transactions must be valued so that each individual member of the multinational can establish its taxable profits. The prices used for these related-party transactions are referred to as the transfer prices. By under-valuing goods or services passed from a high-tax affiliate to a low-tax affiliate or over-valuing goods or services passed from a low-tax affiliate to a high-tax affiliate, the multinational corporation is able to shift profits to the lower-tax firm. While these transactions are supposed to occur at “arm’s length” prices, i.e. the transaction should be priced as it would be if it were occurring between two unrelated parties, difficulty in establishing exactly what the “arm’s length” price would be provides an opportunity to shift profit to low-tax countries.

The recent launching of the OECD action plan on Base Erosion and Profit Shifting (BEPS) is indicative of the increased attention that many countries are turning towards the issue of multinational corporations using transfer prices to shift profits. While the number of countries with regulations designed to make profit shifting more costly, and the complexity of the regulations in place, have increased dramatically in recent years, little is understood about how these regulations affect the behavior of multinational corporations. Specifically, for governments interested in increasing tax revenue, nothing has been done to capture the full effect of increased transfer-pricing regulation on the reported profits of the local affiliate of a multinational corporation. This paper is the first to consider how changes in transfer-pricing enforcement affect three components that determine a local affiliate’s reported profits: the amount that is shifted out to other affiliates of the multinational corporation, the amount that is shifted in from other affiliates of the multinational corporation, and the affiliate’s costs of doing business.

This paper presents a model that illustrates that increased regulation can actually reduce the reported profits of local affiliates of multinational corporations. While past papers have focused solely on how regulations affect an affiliate’s ability to shift profit out to other related parties, this paper uses a model of affiliate-to-affiliate profit-shifting flows to show that regulation will not just affect how much profit is shifted out (outflows), but that it will also affect both how much profit is shifted in (inflows) and the affiliate’s cost of doing business. The potential for increased regulation to affect true profits in the longer run is also discussed.

For firms that are using related-party transactions to shift profits, the effect of increased regulation on reported profits will depend on how the magnitude of the increase in costs compares to the magnitude of the change in profit-shifting flows. If the increase in costs is large or the decrease in outflows is small, then a firm would be expected to reduce reported profits in response to an increase in regulation. For firms that have related-party transactions that are not being used for profit shifting, the sole effect of increased regulation is to increase the cost of doing business. For these firms, increased regulation will reduce reported profits. Overall, the model suggests that many firms would be expected to reduce reported profits in response to increased transfer-pricing regulation. The effect of increased regulation on the reported profits of a specific firm, however, should depend on the distribution of the other

affiliates that are a part of the multinational corporation, as that is what will determine the effect that regulation has on outflows and inflows.

To consider the question of how increased regulation affects reported profits empirically, panel data on the reported profits of multinational corporations at the affiliate level are obtained from the ORBIS database. Changes in transfer-pricing regulation are measured using an index of transfer-pricing risk. Regressing reported profits on the index of transfer-pricing risk reveals a negative relationship between increased regulation and reported profits. The results suggest that the effect of regulation on the cost of doing business must be large relative to the effect of regulation on the amount of profit that is shifted out. This indicates that countries should not expect increased regulation to increase corporate tax collections, and calls into question the optimality of the strategies aimed at increased regulation that have been pursued by many countries in recent years.

The baseline results suggest that an increase of one category in transfer-pricing audit risk reduces reported profits by approximately 1.5%. The magnitude of this effect suggests that the costs associated with increased regulations must be high. While there are many direct costs of increased regulation, e.g. the need to produce more detailed documentation, the magnitude of this result is probably indicative of multinational corporations responding to changes in regulation by making more structural changes, such as changing the path used to shift profits or having to shift some operations out of higher-tax locations and to lower-tax locations in order to facilitate profit shifting. The effect is less negative for firms that have affiliates in lower-tax countries, which is consistent with increased enforcement decreasing profit-shifting outflows. The fact that the effect is still negative, however, again suggests that the effect of regulation on the costs of doing business is large.

The remainder of the paper is structured as follows. Section 2 provides some background on profit shifting and the use of transfer pricing manipulation. It also discusses previous studies of profit shifting, and the assumptions these studies have made about the costs and benefits of profit shifting. Section 3 introduces a model of optimal profit shifting which allows for both differential enforcement across countries and multiple avenues through which enforcement can affect the cost of profit shifting. Section 4 discusses the data used to test the predictions of the model. Section 5 contains the empirical results. The conclusions and implications are discussed in Section 6.

2 Past research on profit shifting

As discussed briefly in the introduction, a multinational corporation can inflate its reported pre-tax profits in low-tax locations by manipulating the transfer prices it uses in related-party transactions.¹ While countries attempt to limit the opportunities for profit shifting by requiring related parties to use the same price that would be set if the transaction were between unrelated parties, in practice it is often extremely difficult to find a comparable transaction between unrelated parties. This is especially true when considering transactions that involve intangibles assets such as intellectual property. There is a growing perception that multinational corporations are using transfer-pricing manipulation to avoid paying their fair share of corporate taxes. This has caused many countries to turn their attention towards trying to limit opportunities for profit shifting. The vast majority of countries now have reg-

¹There are other methods of profit shifting, such as the strategic use of debt, that are not discussed in this paper.

ulations in place requiring corporations to use arm's length prices. There has also been an increase in the number of countries with other transfer-pricing specific regulation.² These regulations include, for example, limitations on the methods that can be used for establishing an arm's length price, specific requirements for the documentation needed to support the transfer prices used and transfer-pricing specific penalties. On top of the increase in regulatory complexity, countries have been devoting increased resources to transfer-pricing compliance, with many countries creating transfer-pricing specific audit teams. The increasing number of publications aimed at helping firms navigate the transfer-pricing environment also reflects this increase in regulatory complexity over time. The effect of the increased focus of tax agencies on transfer-pricing compliance is reflected in surveys by the Big Four accounting firms that indicate that an increasing number of firms identify transfer-pricing compliance as a major tax risk.³

Past research on profit shifting has generally been focused on finding evidence that multinationals are responding to the tax differentials that exist across affiliates and on estimating the sensitivity of reported profits to these corporate tax rates. The true profits of the affiliates of multinational corporations are not known to researchers, leading papers to use a variety of methods to estimate the extent to which multinationals actually manipulate the distribution of profits across affiliates in response to tax incentives. Hines & Rice (1994), and some papers that followed, such as Huizinga & Laeven (2008), assume that true profits are generated by a Cobb-Douglas production function and so estimate true profits based on available data on assets, labor compensation and a proxy for productivity. These papers find evidence that reported profits deviate from estimated true profits in a manner that is consistent with profit shifting; higher than expected profits are reported by low-tax affiliates and lower than expected profits are reported by high-tax affiliates. These studies have used a variety of data sets, which results in variation in the magnitude of the estimated responsiveness of reported profits to the corporate tax rate. Heckemeyer & Overesch (2013) do a meta-analysis of the existing literature. They determine that the consensus estimate of the semi-elasticity of reported profits with respect to the corporate tax rate is 0.8, which indicates that a 10 percentage point increase in the corporate tax rate would decrease reported profits by 8%. Clausing (2003) uses a different approach and looks at US intra-firm trade flows. She finds evidence that strongly suggests that sales to low-tax affiliates are underpriced and that sales to high-tax affiliates overpriced, which is consistent with transfer prices being used for the purpose of profit shifting. Dharmapala & Riedel (2013) examine how earnings shocks at the parent level are passed along to subsidiaries and find that earnings shocks are associated with an increase in pre-tax profits at low-tax affiliates relative to high-tax affiliates. This is again suggestive of profit shifting. Their results suggest that 2% of parent income is shifted out to lower-tax affiliates.

Early models of profit shifting, such as those in Hines & Rice (1994) and Grubert & Mutti (1991), gave the simple prediction that the declared profits of affiliate i should depend negatively on the corporate tax rate in affiliate i 's home country, τ_i . As mentioned above, a number of studies confirmed this negative relationship between reported profits and the statutory corporate tax rate. The limitations of having to use aggregate data, however, meant that little attention was given to the role of the tax

²This is emphasized in many of the transfer-pricing surveys published by the Big Four accounting firms. See, for example, pages 6-11 of Ernst & Young (2012).

³See, for example, the Ernst & Young 2012 Tax Risk and Controversy Survey.

rates of the other countries in which a multinational operates. Huizinga & Laeven (2008) further solved through the Hines and Rice framework to yield the prediction that the amount of profit shifting into or out of country i depends on the tax rates in all n countries in which the multinational corporation operates, as well as on the tax differentials between country i and all countries $k \neq i$. The main contribution of this extension is that it provides a model driven prediction of the magnitude of shifting and allows to define which countries will be “low tax” enough to be the recipient of shifted profits within a multinational. While previous papers often had to depend on using a specific reference country, so that the set of higher-tax affiliates and a set of lower-tax affiliates were defined, the result by Huizinga and Laeven allows for the flows of profits within a multinational to be modeled more generally. Overall, while there is variation in the methods used and, therefore, in the estimated elasticity of reported profits, papers have generally found evidence that supports the theory that reported profits respond to differences in corporate tax rates.

While the incentives for profit shifting have received a great deal of attention, little attention has been given to what determines the cost of profit shifting. Most theoretical models of optimal profit shifting have simply assumed that the cost of shifting depends on the amount shifted, and have ignored other, likely important, determinants of the cost.⁴ As mentioned above, countries are increasingly devoting resources towards trying to prevent profit shifting through transfer pricing manipulation and the strategic use of debt. These changes in the effort and resources devoted to prevent profit shifting should translate into a change in the cost of shifting. Additionally, differences across countries in the strictness of regulation and resources available to limit shifting should change the incentives a firm faces when deciding how to shift profits between affiliates. It should be far more costly to shift profits out of a country with well-trained tax officials and high penalties for transfer pricing abuse than it is to shift profits out of a country where the tax enforcement agency has limited resources. While there have been some papers that have focused on profit shifting in developing countries, with a focus on the fact that these developing countries may be less able to detect, and therefore prevent, profit shifting, e.g. Fuest et al. (2011), the only papers in the literature on profit shifting that have explicitly included transfer-pricing enforcement effort as a factor in determining the responsiveness of reported profits to corporate tax differentials are Bartelsman & Beetsma (2003), Lohse & Riedel (2012), Beer & Loeprick (2013), and Klassen & Laplante (2012).

In Bartelsman & Beetsma (2003), transfer-pricing enforcement is not added to the theoretical model of optimal profit shifting that is used to develop their empirical strategy, but they do add a rough measure of enforcement as a robustness check in their empirical section. They create an enforcement index for each country in their sample based on (1) the existence of explicit transfer pricing rules, (2) the existence of formal transfer pricing documentation rules and (3) the existence of transfer pricing specific penalties. They include this enforcement index in country i as a determinant of the reported value added by the firm in country i . They find that the responsiveness of reported value added to tax differentials seems to be stronger for observations with lax enforcement than it is for observations with strict enforcement. While an important first step, the measure of enforcement used does not allow for a great deal of variation and their data set only includes multinational firms located in 16 different countries. Additionally, from the perspective of a government, the question when considering stricter

⁴These models have assumed that the cost of shifting is an increasing non-linear function of the amount shifted. This assumption means that there will be an interior solution for optimal shifting.

enforcement is not simply one of if that enforcement decreases profit shifting, but rather if that stricter enforcement would be expected to increase tax revenue.

Lohse & Riedel (2012) use an index of transfer-pricing documentation requirements to proxy for enforcement, where countries are placed in one of three possible categories. While this measure captures differences in cost due to stricter documentation requirements, it has clear limitations because it does not capture how likely it is that the documentation will actually be examined or the likelihood of penalties being imposed if the transfer prices are challenged. The advantage to the measure, however, is that the information needed is available for both a large set of countries and a long time period. Using this measure of enforcement, they find, using a firm fixed-effects approach, that increased enforcement decreases reported profit, but that the effect is less negative for higher tax rate countries. They use this evidence to conclude that transfer-pricing regulation is key if a government wishes to make reported profits less responsive to increases in the corporate tax rate. Their results suggest that documentation requirements reduce the responsiveness of reported profits to the corporate tax rate by 50%. They focus on how enforcement affects profit shifting, which, although important, is only one part of the effect of enforcement on reported profits.

Beer & Loeprick (2013) look at the initial date of introduction of mandatory transfer-pricing documentation requirements across countries. Unlike other papers, they consider the time path of the response of reported profits to the mandatory requirement. They find that the interaction of a variable capturing the number of years since the implementation of the documentation requirement and the corporate income tax differential between a firm and its affiliates has a negative, but insignificant coefficient. A quadratic in the time since the introduction of the documentation requirement interacted with the same tax differential, however, has a positive and significant coefficient. They take this to indicate that it takes time for documentation requirements to reduce profit shifting. It is difficult to tell if this lagged response is actually due to the documentation requirement taking effect or if it is the result of policies that are likely to follow the implementation of documentation requirements. Their results suggest that, within 4 years, documentation requirements lower the responsiveness of reported profits to the corporate tax rate by about 60%, similar to what is found by Lohse and Riedel. Their paper again focuses solely on how enforcement affects firms responsiveness to tax differentials rather than focusing on the full effect of enforcement.

Klassen & Laplante (2012) give more consideration to the interaction between enforcement and profit shifting by recognizing the role that enforcement in other countries plays in determining profit shifting into and out of the United States. It is the only paper to go beyond looking at the relationship between reported profits and own-country enforcement. They use a number of different measures of transfer pricing regulation for the countries in which a corporation is active and find that lower regulation in the United States is correlated with greater shifting to low-tax locations. While they find some suggestive evidence, they are unable to conclusively support the hypothesis that increases in the regulation parameter decrease shifting into the United States for firms with a high average foreign tax rate. Their paper takes the important step of considering how enforcement efforts in other countries should affect reported profit in the United States, something that is not recognized in the two papers mentioned above.

With the focus governments have placed on transfer-pricing enforcement as a way to increase tax

revenues, it seems important to better understand how enforcement levels and changes in enforcement levels over time have affected profit shifting. The papers above all consider the effect that enforcement has on deterring firms from shifting profit out of a given country. This paper will show, in a simple theoretical framework, that enforcement should also be expected to affect shifting in and the cost of doing business. The major contribution that this paper makes to the literature is that it recognizes that these three effects must all be considered when weighing the costs and benefits of increased enforcement. These three effects will also result in heterogeneity in how a firm's reported profit responds to a change in enforcement. Additionally, the model gives a framework in which to consider how enforcement in other countries in which affiliates are located will affect the reported profits of the local affiliate. To capture enforcement, an index of transfer price risk developed in Mescall (2011) is used. Compared to simple measures of documentation requirements, it better captures the full set of transfer-pricing regulations that exist in a given country. The analysis that follows focuses on profit shifting through transfer-pricing manipulation and ignores profit shifting through the strategic use of debt and other mechanisms. This approach seems reasonable given the recent focus on transfer pricing by governments and the popular press. Additionally, there is a great deal of variation in transfer-pricing enforcement across countries and over time which will allow for the estimation of the effect of increased enforcement. The theoretical framework could be adapted to apply to either method of profit shifting, but, because of the empirical focus, the framework is discussed in terms of the effect of changes in transfer-pricing enforcement.

3 Framework

Before moving to the question of how changes in enforcement will affect reported profit, let us first step back and consider what determines reported profits for an affiliate of a multinational corporation. Reported profits can be expressed as:

$$\textit{Reported Profits} = \textit{True Profits} - \textit{Outflows} + \textit{Inflows} - \textit{Costs of Related Party Transactions}$$

The basic idea of the model that follows is that a change in enforcement will affect optimal outflows, optimal inflows, and the cost of related-party transactions. The change in outflows is likely to be the only positive effect of increased enforcement on reported profits. An increase in enforcement will increase the costs of related-party transactions. The effect of enforcement on inflows is ambiguous, for reasons discussed below, and must be considered empirically. Reported profits will fall for any firm for whom the decrease in outflows is dominated by the increase in the cost of related-party transactions. The cost of related-party transactions is likely to be composed of a number of different pieces.

Most of the papers that have looked at the effect of enforcement on profit shifting have solely looked at how enforcement affects the amount shifted, and have concluded that enforcement makes firms less responsive to tax differentials. Changes in enforcement, however, should affect outflows, inflows and the cost of shifting. In that respect, there is both a behavioral response to enforcement that must be considered, i.e. changes in optimal shifting, and a direct response, the change in the cost of shifting.

In order to consider variation in enforcement, both across countries and over time, it is necessary to move beyond standard models of profit shifting. Standard multi-country models of profit shifting

allow a multinational corporation to maximize after-tax profits with respect to net inflows and outflows of profits, but do not allow the corporation to maximize with respect to gross flows between country pairs. More precisely, the corporation is allowed to select, S_i , the net amount of profit that is taken into or out of the affiliate in country i , but it is not allowed to select how much goes from country i to country j or from country k to country i . The model used in Hines & Rice (1994) and Huizinga & Laeven (2008), for example, considers a multinational corporation that maximizes:

$$\max_{S_i} \sum_{i=1}^n (1 - \tau_i) \left(B_i + S_i - \frac{\gamma S_i^2}{2 B_i} \right)$$

subject to the constraint:

$$\sum_{i=1}^n S_i = 0$$

where B_i is the true, before tax, profit of the affiliate in country i and S_i is the amount shifted to the affiliate in country i from other affiliates. The corporation maximizes profits by setting net shifting out of country i , S_i , such that:

$$(1 - \tau_i) \left(1 - \frac{\gamma_i S_i}{B_i} \right) - \lambda = 0$$

where λ is the multiplier on the constraint that $\sum S_i = 0$. As solved for in Huizinga and Laeven, this means that the net shifting out of country i depends on the corporate tax rate in country i relative to the corporate tax rates in countries $k \neq i$ in the following way:

$$S_i = \frac{B_i}{\gamma(1 - \tau_i)} \frac{\sum_{k \neq i}^n \frac{(\tau_k - \tau_i)}{(1 - \tau_k)} B_k}{\sum_{k=1}^n \frac{B_k}{(1 - \tau_k)}}$$

The multiplier on the cost of shifting, γ , can be thought of as representing, among other things, enforcement effort. A higher value of γ reduces net shifting out of affiliate i .

Variation in enforcement, however, cannot be captured by simply making the multiplier country specific. In considering the profit shifting involving the affiliate in country i , net shifting, S_i , comes from some profit being shifted in from higher-tax affiliates and some profit being shifted out to lower-tax affiliates. It is not correct, then, to say that the enforcement level in firm i 's own country is the only thing that matters in determining the cost of S_i . The country that has profit shifted out is likely have a stronger incentive to try to prevent that shifting. This means that the importance of enforcement in country i in determining the cost of shifting will depend on the direction of the gross flow that is being considered. It will likely be very important if we are looking at profits flowing out of country i to country j , but it will probably be less important if we are looking at profits flowing out of country k and into country i . Enforcement in higher-tax countries, k , should play a major role in determining the cost of shifting in from k , and enforcement in lower-tax countries, j , will likely play at least some role in determining the cost of shifting out to the affiliates in lower-tax countries. Additionally, it

seems reasonable to assume that the cost of shifting depends not only on net shifting, but also on the magnitude of gross shifting flows. The cost of documentation requirements, for example, should not just depend on the amount of net shifting that a firm does, it should also depend on the number of related party transactions the firm has. A firm that shifts ten thousand dollars in and ten thousand dollars out should face some positive cost of shifting.

Consider a multinational that is active in n countries and has one affiliate in each of those countries. Assume that the affiliate is indexed by the ranking of the corporate tax rate it faces, such that affiliate one faces the lowest corporate tax rate of any affiliate in the multinational corporation, affiliate three faces the third lowest corporate tax rate, etc. Assume that profit flows between countries always move in the direction of the tax differential.⁵

For affiliate i then, S_i is composed of two pieces, profits that flow out to lower-tax countries and profits that flow in from higher-tax countries. This means that S_i can be represented as:

$$S_i = \sum_{j=1}^{i-1} S_{ij} - \sum_{k=i+1}^n S_{ki}$$

where S_{ij} is shifting out of country i to country j and S_{ki} is shifting out of country k to country i .

Assume that share α , $0 \leq \alpha \leq 1$, of the cost of shifting from i to j , c_{ij} , is deducted in the higher-tax country and share $(1 - \alpha)$ is deducted in the lower-tax country. Since deductions have more value in the higher-tax country, it is likely that α is close to one, but this restriction is not imposed. In addition to the costs associated with each related-party transaction, assume, as discussed above, that affiliate i faces a fixed cost of dealing with its home country's regulatory environment, FC_i . The inclusion of this fixed cost is intended to capture the fact that a more complex regulatory environment may necessitate hiring an accounting firm or using an accounting firm with greater intensity. This is the cost that is likely to be large, as a firm might, for example, be forced to increase the scale of operations at a low-tax affiliate in order to facilitate profit shifting, even when the direct return of that additional investment is low. This cost is not additive across transactions, although it is still possibly increasing in the number of related party transactions a firm has. This would be the case if, for example, the fee charged by the accounting was increasing in the size of the firm. It is also possible, however, that it is the firms with complex structures that are most able to adjust to changes in regulation, in which case this cost would be lower for large firms, as those firms have more potential ways to shift profits. This cost could be related, then, to the size of the firm, the number of subsidiaries the firm has, the industry of the firm and any other factors that determine how transfer-pricing regulation affects a firm, but it is not directly a function of a firm's distribution of subsidiaries. This means that the corporation maximizes:

$$\max \sum_{i=1}^n (1 - \tau_i) (B_i - FC_i - \sum_{j < i} S_{ij} + \sum_{k > i} S_{ki} - \sum_{j < i} \alpha c_{ij} - \sum_{k > i} (1 - \alpha) c_{ki}) \quad (1)$$

⁵This will always hold if the cost of shifting between two countries only depends on the amount shifted between the two countries. In another paper, Saunders-Scott (2013), I show that it will not always hold if the cost of shifting between i and j depends on both the amount shifted from i to j and the net amount shifted out of i . In this paper, I only consider a model where the gross flow is what matters in determining the cost.

There are a number of things that should contribute to determining the cost of shifting profit between a given pair of affiliates, c . In terms of thinking about how regulations affect the cost of shifting, it seems clear that some regulations, such as penalties imposed if a company is found to have manipulated its transfer prices, will mostly contribute to increasing the cost of each dollar of shifting. Other things, however, such as documentation requirements or restrictions on cost-contribution agreements or advance-pricing agreements will have an effect on the cost of doing business for firms that are not actually shifting profit between affiliates. Even an increase in audit risk is likely to increase costs for a firm that is not actually doing any shifting, as that firm will still have to put additional resources towards justifying the transfer prices used in its related party transactions.

In terms of thinking about the cost of shifting and how it relates to the amount shifted then, it seems reasonable to think of the cost as being composed of two pieces. The first piece is essentially the variable cost, g , which is increasing in the amount shifted between an affiliate in i and an affiliate in j (S_{ij}), the enforcement level in country i (E_i), the enforcement level in country j (E_j), the true profits in countries i and j , (B_i and B_j respectively) and a vector of additional variables (X_{ij}), which includes other things that might cause variation in the cost of shifting, such as the sector of the firms. The second piece of the cost function can be thought of as the fixed cost of having related party transactions. This piece, f , does not depend on the amount that is shifted between the two affiliates, but does depend on the level of enforcement in each country, the size of each affiliate and other characteristics of the firms.

$$c_{ij} = g(S_{ij}, E_i, E_j, B_i, B_j, X_{ij}) + f(E_i, E_j, B_i, B_j, X_{ij}) \quad (2)$$

This could, of course, be rewritten as a single function, where E_i and E_j each appeared both interacted with S_{ij} and separately on their own, but the form above gives greater clarity to these two different components. Assuming the fixed cost of using the related party transaction is not too high, optimal shifting between the affiliate in country i and country j is determined by:

$$\frac{\partial g_{ij}}{\partial S_{ij}} = \frac{(\tau_i - \tau_j)}{(1 - \alpha_{ij}\tau_i - (1 - \alpha_{ij})\tau_j)} \quad (3)$$

where g_{ij} simply indicates that the function g is being evaluated at the values specific to affiliates i and j , i.e. $g_{ij} = g(S_{ij}^*, B_i, B_j, E_i, E_j, X_{ij})$. For the firm in country i then, assuming that the fixed cost of related-party transactions is low enough that profits are shifted between each affiliate pair where there is a tax incentive to do so, reported profits will be equal to:

$$\Pi_i^R = \left(B_i - FC_i - \sum_{j=1}^{i-1} S_{ij}^* + \sum_{k=i+1}^n S_{ki}^* - \sum_{j=1}^{i-1} \alpha c_{ij} - \sum_{k=i+1}^n (1 - \alpha) c_{ki} \right) \quad (4)$$

The question of interest in this paper is how a change in enforcement in country i affects reported profits in country i . Additionally, we can consider how reported profits in country i are affected by changes in enforcement in countries in which higher-tax affiliates are located and changes in enforcement in countries in which lower-tax affiliates are located.

To consider the effect of increased enforcement in country i on the reported profits of the affiliate in country i , it is necessary to consider the effect E_i has on outflows, $\sum S_{ij}^*$, on inflows, $\sum S_{ki}^*$, on the

cost of outflows, $\sum \alpha_{ij} c_{ij}$, on the cost of inflows, $\sum (1 - \alpha_{ki}) c_{ki}$, and on FC_i . Enforcement is the interaction of many discrete policies, so clearly is not actually a continuous variable, but, for analytical tractability, it is treated as a continuous variable in this section. The actual measure of enforcement I used in the empirical analysis is described in Section 4.1.

$$\frac{d\Pi_i^R}{dE_i} = -\frac{dFC_i}{dE_i} - \sum_{j=1}^{i-1} \frac{dS_{ij}^*}{dE_i} + \sum_{k=i+1}^n \frac{dS_{ki}}{dE_i} - \sum_{j=1}^{i-1} \alpha_{ij} \frac{dc_{ij}}{dE_i} - \sum_{k=i+1}^n (1 - \alpha_{ki}) \frac{dc_{ki}}{dE_i} \quad (5)$$

Evaluating how S_{ij}^* must change in response to an increase in E_i , we know that S_{ij}^* must satisfy:

$$\frac{\partial g_{ij}}{\partial S_{ij}^*} = \frac{(\tau_i - \tau_j)}{(1 - \alpha_{ij}\tau_i - (1 - \alpha_{ij})\tau_j)}$$

Since the right-hand side is unchanged when E_i changes, it must be that S_{ij}^* adjusts to leave the left-hand side unchanged. This means that:

$$\frac{\partial S_{ij}^*}{\partial E_i} = - \left(\frac{\partial^2 g_{ij}}{\partial E_i \partial S_{ij}^*} \right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^{*2}} \right)^{-1}$$

Evaluating the change in reported profit with respect to a change in enforcement in country i gives the following:

$$\begin{aligned} \frac{d\Pi_i^R}{dE_i} = & \underbrace{\sum_{j=1}^{i-1} \left(\frac{\partial^2 g_{ij}}{\partial E_i \partial S_{ij}^*} \right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^{*2}} \right)^{-1}}_A - \underbrace{\sum_{j=1}^{i-1} \alpha \left(\frac{\partial g_{ij}}{\partial E_i} + \frac{\partial S_{ij}^*}{\partial E_i} \frac{\partial g_{ij}}{\partial S_{ij}^*} + \frac{\partial f_{ij}}{\partial E_i} \right)}_B \\ & - \underbrace{\sum_{k=i+1}^n \left(\frac{\partial^2 g_{ki}}{\partial E_i \partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial S_{ki}^2} \right)^{-1}}_C - \underbrace{\sum_{k=i+1}^n (1 - \alpha) \left(\frac{\partial g_{ki}}{\partial E_i} + \frac{\partial S_{ki}^*}{\partial E_i} \frac{\partial g_{ki}}{\partial S_{ki}^*} + \frac{\partial f_{ki}}{\partial E_i} \right)}_D - \frac{dFC_i}{dE_i} \end{aligned} \quad (6)$$

While this expression looks complicated, each term simply captures that a change in enforcement in country i will have an effect on profit-shifting outflows, the cost of profit-shifting outflows, profit-shifting inflows, the cost of profit-shifting inflows, and the fixed cost of doing business respectively. Summation A captures the fact that an increase in enforcement decreases the amount shifted out to each affiliate in a lower-tax country. In considering the cost of outflows, both the change in enforcement and the change in the amount shifted from country i to country j will have an effect on the cost. These changes in costs are captured by the three terms of the summation labeled B. All else equal, an increase in enforcement increases g_{ij} , this is captured by the first term of summation B. In response to an increase in enforcement though, there will be a decrease in the amount shifted from i to j and this will decrease g_{ij} , this is captured by the second term of the summation B. Finally, an increase in E_i will increase the fixed cost, f_{ij} , of having related-party transactions between the affiliate in i and the affiliate in j , this is captured by the third term of the summation B. Summation C captures the fact that an increase in enforcement in country i will also change profit-shifting inflows from all higher-tax affiliates. If an increase in enforcement increases the cost of shifting profit in, then this term

will be negative, capturing the fact that inflows will decrease and that will reduce reported profits. It is possible, however, that an increase in enforcement actually makes shifting in less costly, in that case, this term will be positive.⁶ Finally, summation D captures the fact that, to the extent that the costs of shifting from a higher-tax affiliate to the affiliate in country i are actually deducted in the lower-tax country, i , determined by the value of α_{ki} , the change in the cost of shifting from k to i will change reported profits in country i . Assume for now that an increase in E_i increases the cost of shifting from k to i . In that case, the first part of the summation captures the fact that the increase in the cost g_{ki} that results from the increase in E_i will decrease reported profits. The second piece of the summation captures the fact that the decrease in S_{ki} that results from the increase in E_i will decrease g_{ki} and increase reported profits. Finally, the third piece of summation D captures the fact that an increase in E_i will increase f_{ki} , which will decrease reported profit. The final term, $\frac{dFC_i}{dE_i}$, simply captures the fact that an increase in transfer-pricing regulation will increase the fixed cost of doing business in country i .

Simplifying the summation a bit more and grouping terms gives the following:

$$\begin{aligned} \frac{d\Pi_i^R}{dE_i} = & \sum_{j=1}^{i-1} \left(\left(1 + \alpha \frac{\partial g_{ij}}{\partial S_{ij}} \right) \left(\frac{\partial^2 g_{ij}}{\partial E_i \partial S_{ij}} \right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^2} \right)^{-1} - \alpha \frac{\partial g_{ij}}{\partial E_i} - \alpha \frac{\partial f_{ij}}{\partial E_i} \right) \\ & - \sum_{k=i+1}^n \left(\left(1 - (1 - \alpha) \frac{\partial g_{ki}}{\partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial E_i \partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial S_{ki}^2} \right)^{-1} + (1 - \alpha) \frac{\partial g_{ki}}{\partial E_i} + (1 - \alpha) \frac{\partial f_{ki}}{\partial E_i} \right) - \frac{dFC_i}{dE_i} \end{aligned} \quad (7)$$

Under the assumption that an increase in enforcement also makes it more costly to shift profits in, the first term of the first summation of equation 7 is the only positive term in the expression. For an increase in enforcement in affiliate i 's home country to have a positive effect on its reported profit, it must be that this first term is large relative to the other, negative, terms. For the majority of firms, then, it seems that an increase in enforcement should actually be expected to decrease reported profits.

For a firm with only higher-tax affiliates, the effect should be unambiguously negative. For a firm with only lower-tax subsidiaries, the second summation would disappear. This means that there an increase in its home country's enforcement level would increase reported profits if the first summation is positive enough to offset the increase in the fixed cost of doing business. The only way the first summation can be positive is if, for each transaction with lower-tax affiliates, the reduction in the profit shifted out and the decrease in the cost that results from that is greater than the direct effect of enforcement on the variable cost of shifting and the direct effect of enforcement on the fixed-cost of the related-party transaction. If this is true, then it would suggest that the response of reported profits to own-country enforcement should be less negative for firms with more low-tax subsidiaries.⁷

⁶It could be possible, for example, that increased enforcement in country i means that officials in country k trust the reported profits in country i more, and, therefore, actually pay less attention to transactions between the affiliate in country k and the affiliate in country i . In that case, the increase in enforcement could actually make it easier to shift from k to i . While it still seems likely that enforcement in the lower-tax country would increase the cost of shifting to that country, the question of how enforcement maps to the cost of enforcement is ambiguous from the perspective of theory and is ultimately an empirical question.

⁷Controlling for size and other things that determine the opportunities for shifting. It is not necessarily true that a firm with five small lower-tax affiliates should respond less negatively to increased enforcement than a firm with one large lower-tax affiliate. If, on the other hand, two firms are identical in all respects outside of the fact that firm 2 has an additional lower-tax affiliate, then the response of firm 2's reported profits to increased enforcement should be less negative.

If the first summation is positive for some firms, then this leaves open the possibility that some firms would increase reported profits in response to an increase in own-country enforcement while others would decrease reported profits.

All of this analysis is for a multinational that is actually shifting profit between affiliates. In some sectors, it will be the case that the marginal cost of shifting between affiliates is high enough that no shifting occurs. For any two affiliates, it will be optimal set S_{ij} to zero if Equation 3 is not satisfied by a positive value of S_{ij} . When no shifting between affiliates occurs, the only effects of an increase in enforcement are to increase the fixed cost of related-party transactions and to increase the fixed cost of doing business in that country. This means that the firm could experience a decrease in profits either because it is still uses related-party transactions to obtain goods and services, and those transactions are now more expensive, or because the increase in the cost of the related-party transaction causes the firm to switch to obtaining the good or service from an unrelated party. All firms that are not shifting profit, but that do use related-party transactions, should experience a reduction in reported profits when there is an increase in enforcement. In sectors where arm's length prices are easier to identify and, therefore, opportunities for profit-shifting are limited, we should see all firms experience a reduction in reported profits, even those firms with many lower-tax subsidiaries. For any firm that does not have international affiliates, increased transfer-pricing enforcement should have no effect on reported profits.

Together, these predictions suggest that, for a country with a relatively low corporate tax rate, an increase in enforcement would be very likely to decrease tax revenue, as many of the firms affected by the increase in enforcement will be firms with many higher-tax affiliates and few lower-tax affiliates. Even for a country with a high corporate tax rate, increased transfer-pricing enforcement can only have the potential to increase reported profits, and therefore tax revenue, if there is evidence that the reduction in outflows in response to increased enforcement is large. Together, these results suggest that an indiscriminate increase in transfer-pricing enforcement that affects all related-party transactions should only be considered in countries where transfer-pricing abuse is a real problem. A country that implements transfer-pricing regulation simply as a preventative measure is very likely to experience a reduction in tax collections. The push towards all countries implementing detailed transfer-pricing regulation, therefore, does not actually seem to be in the best interests of those countries, at least from the perspective of tax collections.

Consider now, instead, the effect of enforcement in a higher-tax country, say affiliate k 's home country, on reported profit in country i . As long as shifting is occurring between affiliate k and affiliate i , then the change in affiliate i 's reported profits from the change in enforcement in affiliate k 's home country can be represented as:

$$\frac{d\Pi_i^R}{dE_k} = \frac{dS_{ki}^*}{dE_k} - (1 - \alpha) \frac{dc_{ki}}{dE_k} - \frac{dFC_i}{dE_k}$$

Using the result above, we know that:

$$\frac{\partial S_{ki}^*}{\partial E_k} = - \left(\frac{\partial^2 g_{ki}}{\partial E_k \partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial S_{ki}^2} \right)^{-1}$$

so the expressions can be rewritten as:

$$\frac{d\Pi_i^R}{dE_k} = - \left(\frac{\partial^2 g_{ki}}{\partial E_k \partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial S_{ki}^2} \right)^{-1} - (1 - \alpha) \left(\frac{\partial g_{ki}}{\partial E_k} + \frac{\partial S_{ki}^*}{\partial E_k} \frac{\partial g_{ki}}{\partial S_{ki}} + \frac{\partial f_{ki}}{\partial E_k} \right) - \frac{dFC_i}{dE_k} \quad (8)$$

or:

$$\frac{d\Pi_i^R}{dE_k} = \left((1 - \alpha) \frac{\partial g_{ki}}{\partial S_{ki}} - 1 \right) \left(\frac{\partial^2 g_{ki}}{\partial E_k \partial S_{ki}} \right) \left(\frac{\partial^2 g_{ki}}{\partial S_{ki}^2} \right)^{-1} - (1 - \alpha) \left(\frac{\partial g_{ki}}{\partial E_k} + \frac{\partial f_{ki}}{\partial E_k} \right) - \frac{dFC_i}{dE_k} \quad (9)$$

Equation 9 should always be negative. An increase in enforcement in a higher-tax country will decrease profit-shifting inflows into affiliate i , which will decrease the reported profits of affiliate i . The decrease in shifting between affiliate k and affiliate i will decrease the cost of shifting between the two affiliates, but that will only increase the reported profits of the affiliate in country i to the extent to which the cost of shifting is actually deducted in the lower-tax country. Additionally, the cost of shifting will be increased by the direct effect of enforcement on the variable cost of shifting between affiliate k and affiliate i and the direct effect of enforcement on the cost of having related-party transactions between the two affiliates. Finally, it is possible that the increase in enforcement in affiliate k 's home country will increase affiliate i 's use of accounting services or other general costs of doing business and, therefore, increase FC_i , but this effect should be fairly small. Given the small effect that enforcement in affiliate k 's home country is likely to have on the costs that are actually deducted by affiliate i , the change in i 's reported profits will mostly be driven by the change in the amount of profit that flows between k and i . If there is a large reduction in the inflow, then we should see firm i 's reported profit decrease significantly. If there is a small reduction in the inflow, then the effect on firm i 's reported profits will be quite small.

Finally, consider the effect of enforcement in a lower-tax country, say affiliate j 's home country, on affiliate i 's reported profits. If there is shifting between affiliate i and affiliate j , then the change in firm i 's reported profits can be represented as:

$$\frac{d\Pi_i^R}{dE_j} = - \frac{dS_{ij}^*}{dE_j} - \alpha \frac{dc_{ij}}{dE_j} - \frac{dFC_i}{dE_j}$$

The response of S_{ij}^* to a change in enforcement in affiliate j 's home country is given by:

$$\frac{\partial S_{ij}^*}{\partial E_j} = - \left(\frac{\partial^2 g_{ij}}{\partial E_j \partial S_{ij}} \right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^2} \right)^{-1}$$

so the response of affiliate i 's reported profits to a change in enforcement in affiliate j 's home country can be written as

$$\frac{d\Pi_i^R}{dE_j} = \left(\frac{\partial^2 g_{ij}}{\partial E_j \partial S_{ij}} \right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^2} \right)^{-1} - \alpha \left(\frac{\partial g_{ij}}{\partial E_j} + \frac{\partial S_{ij}^*}{\partial E_j} \frac{\partial g_{ij}}{\partial S_{ij}} + \frac{\partial f_{ij}}{\partial E_j} \right) - \frac{dFC_i}{dE_j} \quad (10)$$

or:

$$\frac{d\Pi_i^R}{dE_j} = \left(1 + \alpha \frac{\partial g_{ij}}{\partial S_{ij}}\right) \left(\frac{\partial^2 g_{ij}}{\partial E_j \partial S_{ij}}\right) \left(\frac{\partial^2 g_{ij}}{\partial S_{ij}^2}\right)^{-1} - \alpha \left(\frac{\partial g_{ij}}{\partial E_j} + \frac{\partial f_{ij}}{\partial E_j}\right) - \frac{dFC_i}{dE_j} \quad (11)$$

If g_{ij} is increasing in E_j , then the first term represents the fact that increased enforcement in firm j 's home country deters some shifting from i to j . This increases firm i 's reported profits. The decrease in the amount shifted from i to j also decreases the cost of shifting from i to j . This also works to increase the reported profits of affiliate i . Increased enforcement in firm j 's home country, however, also has a direct effect on the cost of shifting between i and j , so αc_{ij} will increase. This will decrease firm i 's reported profits. Additionally, changes in enforcement in affiliate j 's home country might affect the fixed cost firm i faces of dealing with the regulatory environment. The bigger the direct effect of E_j on the three costs is, the more likely it is that an increase in E_j will decrease firm i 's reported profits.

Alternatively, it is possible that g_{ij} is decreasing in E_j . In that case, an increase in E_j would increase outflows, so the first term would capture the resulting reduction in firm i 's reported profits. The direct effect of E_j on g_{ij} would result in an increase in affiliate i 's reported profits. The remaining two terms could be either positive or negative depending on how E_j is related to f_{ij} and FC_i . Overall, regardless of the relationship between g_{ij} and E_j , the effect of an increase in E_j on Π_i^R is ambiguous.

It is worth remembering that, although the above focuses on the question of how profit is reallocated across countries in response to changes in enforcement, there is second question of how enforcement efforts interact with the initial decision to invest in a given country, i.e. how do E_i , E_k and E_j affect B_i , the initial level of profit of affiliate i . As an increase in enforcement can, to some extent, be thought of as an increase in the effective tax rate, in a more general framework, higher levels of enforcement are also likely to decrease reported profits through a decrease in investment in that country. This means that the possibility of decreased tax revenue from an increase in own-country enforcement may be even more of a threat than is suggested by the model that focuses on the impact of enforcement on transfer-pricing behavior alone. The fear that increased enforcement might drive firms to locate operations in lower-enforcement countries might also explain why higher-tax countries would want to push lower-tax countries to implement regulations designed to make profit shifting more difficult.

An additional question that is not considered in this paper is how differences in enforcement across countries affect optimal shifting. Optimal shifting between any two affiliates is given by Equation 3. The effect of E_i and E_j on optimal shifting will depend on the assumptions made about the functional form of g_{ij} . For some forms of g_{ij} , differences in enforcement between firm i 's home country and firm j 's home country can even result in profit shifting that moves against the tax differential. This is a topic I consider in depth in Saunders-Scott (2013). For the purposes of this paper, however, the sign of the change in shifting in response to increased enforcement is what matters, and that will be consistent across different forms.

4 Data

The model above suggests that, controlling for true profits and the tax incentives to shift profits, enforcement in both the country a firm is located in and the other countries in which the firm has

affiliates should affect the firm’s reported profits. To test this, information on reported profits by affiliate, a proxy for true profits, corporate tax rate information for the firm and its affiliates and information on the level of transfer-pricing enforcement across countries is needed. The major focus of this paper is the role of enforcement, so the main measure of transfer-pricing enforcement that is used is described first. The country-level data collected on corporate tax rates, GDP per capita and government deficits are then described. Finally, the firm-level data on reported profits and other firm characteristics are described. It is possible to obtain panel data on firm-level variables, as well as enforcement and corporate tax rates. This allows for the use of a firm fixed-effects specification in the empirical section. This approach accounts for unobservable characteristics of the firm. Response to changes in transfer-pricing enforcement will be identified off of changes in enforcement levels over time, so it is important that the enforcement measure used have within-country variation over time.

4.1 Enforcement

Transfer-pricing enforcement can take many different forms, which means that countries can differ in their transfer-pricing enforcement along many different dimensions. This means that it is very difficult to get a single measure of enforcement that will truly capture the variation in the strictness of efforts to prevent profit shifting across countries. While other papers in the area have used measures of transfer-pricing documentation requirements, this paper instead use a measure of transfer-pricing risk, *tprisk*, developed in Mescall (2011). The Mescall index, discussed in detail in Appendix A, takes values between 1.03 and 5.20 depending on the transfer-pricing regulation that is in place in a given country. The factors used in the index include: if disclosure of related party transactions is required on the tax return; the availability of information on comparable transactions; if transfer-pricing penalties can be reduced by keeping sufficient documentation; the perceived likelihood of a transfer-pricing audit; and other, more technical, details of transfer-pricing regulation in a country. This measure is better than documentation-based measures for three reasons. The first, and most important advantage, is that it captures dimensions of transfer-pricing enforcement that go beyond documentation requirements alone. The second reason that the risk measure is preferred to documentation-based measures has to do with the fact that the effect of transfer-pricing documentation on shifting should depend on how likely the paperwork is to actually be examined or challenged by individuals who have the knowledge needed to recognize transfer-pricing abuse. This means that the effect of an increase in the documentation requirement should be specific to the country that is being considered. The inclusion of audit risk as an input in the transfer-pricing risk measure at least partially captures this variation. The third reason the Mescall index is preferred is that it exhibits greater variation over time which can be exploited to estimate the effect of increased enforcement.

As mentioned earlier, past papers that have considered variation in transfer-pricing enforcement have focused on variation in transfer-pricing documentation requirements across countries. In Appendix B, details on a documentation measure that is very similar to that developed in Lohse et al. (2012) are provided. Appendix B also reproduce some of the baseline regressions from Section 5 using the documentation measure instead of *tprisk* to represent variation in enforcement.

Table 1: Sample of Firms

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Firms	16,498	18,174	19,833	22,125	23,163	24,328	23,061	24,898	24,270
Avg Profit (th \$)	6,531	7,722	9,583	9,724	12,204	10,371	10,975	11,899	10,619
Median Profit (th \$)	765	874	812	1,076	1,378	1,190	1,040	1,070	1,092

Note: Sample of firms with positive earnings before interest and tax and information available on cost of employees and fixed tangible assets.

4.2 Country-level data

In order to capture the incentives for profit shifting, information on corporate tax rates is needed for the countries in which the firms in the sample and their subsidiaries are located. Data on the top statutory corporate tax rates (including local taxes) are obtained from Ernst & Young’s worldwide corporate tax guides. This information is supplemented with information from KPMG’s global tax database and Deloitte’s taxation guides to obtain corporate tax rates for as large a set of countries as possible. Additionally, the World Bank database is used to obtain real GDP per capita for all countries that have that information available. Finally, because it seems likely that increasing enforcement is a counter-cyclical policy, information on government deficit is obtained from the World Bank database to control for the possibility that the decision to increase enforcement is a result of decreased tax collections.

4.3 Firm-level data

The Bureau van Dijk ORBIS database is used to obtain information on a sample of multinational corporations. ORBIS is a firm-level dataset that collects information from national and local accounts. It currently contains financial information on over 93 million active corporations. Given that the focus of this paper is how enforcement interacts with the structure of the corporation, the sample is limited to the subset of almost 3 million corporations that have information available on ownership links. To look at the effect of enforcement on reported profit, it is necessary to know reported profit at the firm level rather than at the multinational level. For this reason, the sample is further restrict to the subset of corporations in ORBIS that have unconsolidated reports available. This means that information on assets, labor and reported profit can be obtained for individual affiliates rather than for the entire corporate group. Transfer-pricing enforcement is only going to be relevant for firms that actually have related-party transactions, so the sample is additionally limited to only include firms that own a foreign subsidiary. Given the complex structure of many multinationals, it can be difficult to define ownership links. Although any cutoff used will be somewhat arbitrary, the sample used includes all firms that own at least 50% of a foreign subsidiary that is within ten tiers of the firm (i.e. it would include a firm that owns a domestic firm which owns another domestic firm which owns a foreign firm). For these firms, information is obtained on both foreign subsidiaries and foreign shareholders where there is an ownership link of at least 50%.

All firms are required to have data available for at least one year between 2003 and 2011 on earnings

before interest and tax, the cost of employees and fixed tangible assets. Firms are assumed to produce output using capital and labor, and so the cost of employees and fixed tangible assets are included as proxies for the true profits of the firm. Fixed tangible assets are used over other measures of assets as they are likely to be less endogenous to profit shifting than a measure that also includes intangible assets. Finally, since the paper is examining how enforcement changes the incentives for profit shifting, the statutory corporate tax rate for the country in which the firm is located is also required to be available. The incentives for profit shifting change when a firm has negative profits, so, for now, the sample is limited to firms with positive profits, as the model should do a better job of matching the behavior of these firms. Information on the number of firms in the sample for each year that meet those requirements and the average and median profits of firms in the sample are detailed in Table 1.

The geographic distribution of the firms in the sample is detailed in table 2. The firms are located across 45 countries. While the coverage of firms in ORBIS has expanded in recent years, the focus on European firms is still evident from the large share of firms in the sample that are located in Belgium, France, Italy, Spain and Sweden. Many of the countries in which firms are located are middle tax-rate countries, which, from the perspective of the model, should be the most interesting set of countries in terms of the ambiguity of the effect of increased enforcement.

The main question of interest is how reported profit responds to changes in transfer-pricing enforcement in the home country of the firm. The information needed to generate the preferred measure of transfer-pricing enforcement, *tprisk*, is currently only available from 2006 to 2011, so, in most empirical specifications, that will be the period considered. Table 3 details the availability of the measure for the firms in the sample. It also summarizes the values of the index for the firms in the sample. Although available for a relatively short period, this measure gives a lot of within-country variation over time as, given the multiple dimensions accounted for by the index, countries experience multiple changes over the relevant time period.

In order to both understand the tax incentives for shifting within a multinational, and to capture the effects of affiliate-level enforcement predicted by the model, information on the affiliates of the firms that are in the sample is also required. For the firms in the sample, the locations of all foreign subsidiaries that are at least 50% owned by the firm and all foreign shareholders of the firm that hold a total share of at least 50% of the firm are obtained. While this will capture many of the possible paths for profit shifting, it will not capture all possible paths. This is partially due to the requirement of ownership links of greater than 50%, but is also partially due to the fact that there is not information on affiliates of a multinational that are within the same tier of the multinational corporation. Firms that are parent companies (GUOs) will suffer from the first problem, but not from the second. The issue of ownership links is discussed in more depth in Appendix C.

For the purposes of the analysis, limited information can be obtained on foreign subsidiaries and foreign shareholders. The most important piece of information for understanding the incentives for profit shifting is the location of the affiliate, as that is what makes it possible to link the affiliate with a corporate tax rate and a value for transfer-pricing risk. For some subsidiaries and shareholders, there is information available on assets and revenue, but that information is extremely limited. For firms in the sample, information on the average number of foreign affiliates, the number that are

Table 2: Location of Firm (% of Sample)

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Argentina	0	0	0	0	0	0.004	0.013	0.012	0.012
Austria	0.103	1.326	1.573	2.721	2.962	2.684	2.472	2.35	2.798
Belgium	10.886	10.317	9.802	8.827	8.604	7.958	7.94	8.005	7.977
Bosnia and Herzegovina	0	0	0	0.199	0.319	0.296	0.317	0.257	0.255
Brazil	0	0	0	0	0	0	0.004	0.004	0
Bulgaria	0.249	0.264	0.247	0.262	0.307	0.308	0.299	0.297	0.326
Colombia	0	0	0	0	0	0	0.004	0	0
Croatia	0.933	0.957	0.882	1.071	1.075	1.011	1.015	0.888	0.915
Czech Republic	2.085	2.173	2.133	2.011	2.068	1.961	1.951	1.924	1.842
Denmark	0	0	0	0	0.082	6.112	6.353	6.205	6.786
Ecuador	0	0	0.005	0.005	0.004	0.004	0.004	0.004	0.004
Estonia	0.497	0.462	0.454	0.452	0.453	0.366	0.373	0.37	0.4
Finland	3.77	3.593	3.434	3.304	3.553	3.403	3.231	3.342	3.494
France	16.335	15.935	15.177	14.581	14.454	13.33	12.51	12.708	12.509
Germany	5.031	5.788	9.106	10.088	9.848	9.397	9.527	9.667	9.526
Hungary	0.455	0.594	0.575	0.511	0.527	0.415	0.421	0.466	0.42
Iceland	0.018	0.044	0.04	0.005	0.004	0.021	0.013	0.028	0.049
India	0.006	0.006	0.005	0	0	0.016	0.039	0.04	0.029
Ireland	0	0	0.045	0.362	0.591	0.534	0.503	0.554	0.564
Italy	18.299	19.853	18.469	18.038	17.83	16.635	15.55	15.821	15.863
Japan	0.285	0.336	0.333	0.307	0.268	0.214	0.238	0.289	0.231
Latvia	0.018	0.017	0.02	0.018	0.017	0.012	0.013	0.02	0.016
Liechtenstein	0	0	0	0	0	0	0	0.008	0.008
Luxembourg	0.273	0.319	0.424	0.551	0.548	0.485	0.75	0.727	0.63
Malta	0	0	0	0.009	0.004	0.016	0.013	0.024	0.012
Montenegro	0.006	0.011	0.03	0.036	0.043	0.041	0.052	0.04	0.033
Morocco	0	0	0.005	0.005	0.009	0.008	0.009	0.012	0.008
Netherlands	1.043	1.084	1.074	1.035	1.217	1.102	1.171	1.229	1.228
New Zealand	0	0	0.005	0.009	0.013	0.021	0.017	0.024	0.029
Norway	4.71	4.683	4.729	4.601	4.663	4.559	4.891	4.655	4.747
Poland	0.503	0.539	0.565	0.538	0.596	0.612	0.681	0.598	0.63
Portugal	1.534	1.453	1.568	1.451	1.438	1.278	1.366	1.325	1.29
Romania	0.291	0.281	0.267	0.221	0.268	0.275	0.295	0.237	0.255
Serbia	0.321	0.363	0.318	0.601	0.587	0.571	0.585	0.546	0.511
Slovakia	0.515	0.693	0.923	0.881	0.885	0.81	0.82	0.823	0.655
Slovenia	0.649	0.589	0.555	0.565	0.574	0.551	0.507	0.546	0.536
South Korea	0.327	0.325	0.323	0.289	0.272	0.255	0.299	0.313	0.313
Spain	18.875	17.69	16.392	15.372	14.29	13.084	13.447	13.274	12.423
Sweden	7.601	5.965	6.535	6.432	6.666	6.992	7.12	7.065	7.388
Switzerland	0.055	0.055	0.045	0.036	0.056	0.049	0.061	0.056	0.049
Taiwan	0.073	0.154	0.055	0.859	0.997	0.9	0.919	0.964	0.919
Turkey	0	0	0	0	0	0	0	0	0.004
Ukraine	0.03	0.017	0.025	0.023	0.026	0.029	0.026	0.024	0.016
United Kingdom	4.225	4.116	3.862	3.724	3.881	3.679	4.176	4.253	4.297
Uruguay	0	0	0	0	0	0	0.004	0.004	0

Table 3: Summary of *tprisk* enforcement index for sample used

	2006	2007	2008	2009	2010	2011
% Missing Value	2.87%	5.43%	4.29%	4.33%	3.03%	3.04%
Average	3.81	3.86	3.83	4.09	4.16	4.16
Minimum	1.03	1.03	1.03	1.03	1.03	1.03
Maximum	4.46	4.69	5.09	5.09	4.87	5.20

Note: Calculation of the *tprisk* index is discussed in detail in Appendix A.

Table 4: Composition of affiliates

Average number of Foreign Affiliates	2.59
Median Number of Foreign Affiliates	1
Maximum Number of Foreign Affiliates	218
Average Number of Lower-Tax Affiliates	1.60
Average Number of Higher-Tax Affiliates	.99
% with just higher-tax affiliate	27.19%
% with just lower-tax affiliate	47.39%
% with both	21.69%
% with neither	3.73%

Note: Affiliate refers to both the subsidiaries and the shareholders of the firm in the sample. To be included in the sample, all firms had to have at least one foreign subsidiary.

located in higher-tax countries versus lower-tax countries and the breakdown between subsidiaries and shareholders are detailed in Table 4. The firms in the sample have between 1 and 218 affiliates. The number of subsidiaries ranges between 1 and 218 and the number of shareholders ranges between 0 and 4. Firms have between 0 and 195 lower-tax subsidiaries and between 0 and 167 higher-tax subsidiaries. Firms have between 0 and 4 lower-tax shareholders and between 0 and 4 higher-tax shareholders. The foreign affiliates in the sample are located across 200 countries, with heavy concentrations (defined by there being more than 1% of the total sample of subsidiaries located in that country) in Austria, Belgium, Brazil, China, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, the United Kingdom and the United States.

While changes in the firm's home-country corporate tax rate will generally be used to capture changes in the incentives to shift profits, as the firm-level fixed effects should absorb the opportunities for shifting that are available for the firm, in some specifications the tax differential between the firm and its affiliates will be used instead. The tax differential is defined simply to be the difference between the tax rate that the firm faces and the (unweighted) average of the tax rates faced by all affiliates. If, for example, firm 1 has four affiliates: A1, B1, C1 and D1 then

$$\text{avgtaxdiff}_1 = \tau_1 - \frac{(\tau_{A1} + \tau_{B1} + \tau_{C1} + \tau_{D1})}{4}$$

This measure can also be used to get a sense for how the tax rates of the firms in the sample

Table 5: Subsidiary Characteristics by Firm

	2006	2007	2008	2009	2010	2011
avg tax diff	0.038	0.036	0.024	0.024	0.024	0.025
min tax diff	-0.267	-0.284	-0.242	-0.25	-0.235	-0.233
max tax diff	0.372	0.372	0.340	0.35	0.35	0.35
AvgRiskHiWeight	.201	.212	.199	.204	.214	.220
-std dev	.161	.175	.148	.152	.155	.156
AvgRiskLoWeight	.239	.219	.189	.192	.230	.251
-std dev	.182	.147	.136	.134	.150	.160

Note: For each firm in the sample, the tax difference in a given year is calculated as the tax rate faced by the firm minus the (unweighted) average of the tax rates faced by its subsidiaries. The calculation of the average risk score is discussed in the text.

compare to those of their affiliates. A positive value indicates that a firm is high tax relative to its subsidiaries. Although the weighting should also account for differences in size between the firm and its affiliates, as an approximation, firms with positive values would be expected an incentive to shift out on net. A negative value indicates that a firm is low tax relative to its subsidiaries. These firms would be expected to shift in on net.

The model predicts that the enforcement efforts of the countries in which higher-tax affiliates and lower-tax affiliates are located should also affect reported profit. For each firm, then, in an attempt to capture the level of transfer-pricing enforcement in the countries where subsidiaries are located, the average level of the transfer-pricing risk measure across affiliates is calculated. Reported profit should respond differently to enforcement in higher-tax countries and enforcement in lower-tax countries, so the measure of average enforcement is calculated separately for higher-tax affiliates and for lower-tax affiliates. The exact form of the affiliate enforcement terms will depend on the assumptions made about the functions f , g and FC . For now, the terms used imposes the assumption that the importance of affiliate-country enforcement depends on the tax differential. For higher-tax subsidiaries, for example, the weighted measure of $tprisk$ is calculated as:

$$AvgRiskHiWeight = \frac{\sum_{k=1}^{i-1} (\tau_k - \tau_i) tprisk_k}{(i - 1)}$$

This measure will suffer from the problem that the value will change not only with changes in enforcement in the countries in which subsidiaries are located, but also with changes in own-country or subsidiary-country corporate tax rates. The importance of affiliate-country enforcement clearly should depend on the size of the affiliate, but the limited data available on affiliates preclude that at this time. Table 5 summarizes the tax differences and subsidiary enforcement characteristics for the firms in the sample.

5 Empirical

5.1 Baseline Results

The model predicts that the response to own-country enforcement will vary based on firm characteristics. This means that the response of reported profits to changes in the level of own-country enforcement is potentially ambiguous, but, given the model, it would not be surprising to find a negative relationship. First then, consider a simple firm fixed-effects regression of log reported profits on *tprisk*. In the first column of Table 6, the log of fixed tangible assets and the log employee compensation are included as regressors. These controls are included to capture variation in the true profits of the firm. Both variables have positive and statistically significant coefficients, which is consistent with expectations. The coefficient on *tprisk* is -0.101 and is statistically significant. The value of the coefficient indicates that an increase in a country's *tprisk* index of 0.5, roughly the change that a country would experience if its transfer-pricing audit risk increased by one category, would decrease reported profits by 5%. In the second column, country level controls (log GDP per capita, log GDP per capita squared, and government deficit) and industry (1 digit NACE code) by year fixed effects are included. This lowers the coefficient on *tprisk* to -0.0267, but it is still negative and significant. In the third column, the corporate tax rate faced by the firm is included to control for the fact that we might expect a country to increase its enforcement at the same as it increases its corporate tax rate. This has little effect on the coefficient on *tprisk*. The coefficients in columns (2) and (3) indicate that an increase of one category in audit risk (an increase in *tprisk* of .559) would decrease reported profits by approximately 1.5%.

The firm fixed-effects setting means that the effect of enforcement on reported profits is being estimated off of variation in *tprisk* within a country over time. The estimates will capture both the immediate response to changes in enforcement and any potential delayed response. While the fixed-effects approach reduces concern about the endogeneity across countries of efforts to prevent profit-shifting and reported profits, there is still a concern that changes in *tprisk* over time are correlated with other government policies that also affect reported profits. If that is the case, then the decrease in reported profits found in Table 6 cannot actually be attributed to changes in transfer-pricing enforcement. To test for this, firms that should be unaffected by changes in transfer-pricing regulation, i.e. firms with no international affiliates, are selected from ORBIS.⁸ Controlling for changes in other country-level factors, columns (2) and (3) of Table 7 indicate that changes in transfer-pricing risk do not have a statistically significant effect on the reported profits of firms in this sample.

As mentioned in Section 4.3, the firms in the sample are heavily concentrated in Denmark, France, Italy, Spain and Sweden. In column (1) of Table 8, to ensure that it is not the response of firms in these countries to changes in enforcement that is driving the result, firms that are located in France, Italy and Spain are excluded.⁹ The exclusion of these firms actually results in an even more negative relationship between reported profits and the index of transfer-pricing risk. Interestingly, the statistically insignificant coefficient on the corporate tax rate in column (3) of Table 6 seems to be driven by Italian firms. Excluding Italian firms results in a coefficient on *Tax Rate* of -.52,

⁸Specifically, I select firms that have no subsidiaries and that are less than 5% owned by shareholders. The results are similar if I instead select firms that are less than 10% owned by shareholders.

⁹The three countries that had the highest concentration of firms.

Table 6: Effect of Transfer-Pricing Enforcement

	(1) Log EBIT	(2) Log EBIT	(3) Log EBIT
tprisk	-0.101*** (0.00834)	-0.0267*** (0.00915)	-0.0269*** (0.00916)
Tax Rate			-0.0607 (0.186)
Log Assets	0.0591*** (0.00638)	0.0730*** (0.00662)	0.0730*** (0.00663)
Log Labor	0.404*** (0.0119)	0.401*** (0.0123)	0.401*** (0.0123)
Log GDP		-0.374 (1.083)	-0.390 (1.085)
Log GDP ²		0.191 (0.149)	0.194 (0.149)
Deficit		-0.00320 (0.00201)	-0.00333 (0.00204)
Observations	136,421	135,051	135,051
Within R-squared	0.047	0.061	0.061
Number of Firms	34,502	34,219	34,219
Industry-Year F.E.		✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in all columns is the log of reported profit before interest and taxes. tprisk=index of transfer-pricing risk described in Section 4.1. Tax Rate=corporate tax rate in the firm's home country. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

Table 7: Placebo Group

	(1)	(2)	(3)
	Log EBIT	Log EBIT	Log EBIT
tprisk	-0.113*** (0.0228)	-0.0297 (0.0261)	-0.0291 (0.0260)
Tax Rate			0.524 (1.039)
Log Assets	0.0629*** (0.0175)	0.0651*** (0.0178)	0.0654*** (0.0178)
Log Labor	0.256*** (0.0409)	0.242*** (0.0415)	0.242*** (0.0416)
Log GDP		-1.984 (2.917)	-1.962 (2.916)
Log GDP ²		0.601 (0.463)	0.587 (0.465)
Deficit		-0.0130** (0.00534)	-0.0140** (0.00574)
Observations	15,888	15,855	15,855
Within R-squared	0.021	0.039	0.039
Number of Firms	4,518	4,509	4,509
Industry-Year F.E.		✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in all columns is the log of reported profit before interest and taxes. tprisk=index of transfer-pricing risk described in Section 4.1. Tax Rate=corporate tax rate in the firm's home country. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

which suggests that a 10% increase in the corporate tax rate decreases reported profits by 5.2%. It is possible that, through the early part of the sample, Italian firms were still responding to the changes in corporate taxation that occurred in 2004. Column (2) of Table 8 only includes firms that are their own global ultimate owner, while Column (3) only includes firms that are not their own global ultimate owner. GUOs are different from non-GUOs both in the fact that more complete affiliate information is included for GUOs and in the fact that the incentives for shifting might be different for parent firms.¹⁰ The relatively small sample of GUOs means that the estimates are noisy, but the magnitude of the coefficient on *tprisk* is very similar across the two groups. Although insignificant, the positive coefficient on the corporate tax rate in column (2) is consistent with corporations being reluctant to shift profits away from the parent firm.

These baseline results suggest that increased transfer-pricing enforcement has a negative effect on reported profits. The fact that this effect is not seen for a group of firms that should be unaffected by transfer-pricing regulation is consistent with the interpretation that the results are reflecting a change in transfer-pricing enforcement. The relatively large magnitude of the effect of increased enforcement may indicate that the results are capturing both an increase in the cost of doing business, and the longer-run relocation of investment to lower-enforcement locations.

5.2 Heterogenous response to own-country enforcement

The model predicted that a positive response of reported profits to transfer-pricing enforcement was most likely for firms that have lower-tax affiliates. A negative response of reported profits to transfer-pricing enforcement was most likely for firms with few lower-tax affiliates and many higher-tax affiliates. The most basic test for this is to see if firms with low-tax affiliates respond differently to changes in transfer-pricing risk than firms that do not have low-tax affiliates. The model predicts that the effect of increased transfer-pricing enforcement should be less negative for firms that do actually have lower-tax affiliates, as these are the firms where increased enforcement can have a deterrent effect and can, therefore, serve to decrease outflows and increase reported profits. Table 9 shows evidence that is consistent with this hypothesis. Column (1) replicates the baseline specification for firms that have lower-tax affiliates, while Column (2) replicates the same specification for firms that do not have lower-tax affiliates. The response of reported profits to an increase in enforcement is significantly more negative for firms that do not have lower-tax affiliates. Columns (3) and (4) replicate the same regressions for firms that have lower-tax subsidiaries versus those that do not, the results are very similar.

Another basic test for the prediction of the model is to see if the response of reported profit to transfer-pricing enforcement is less negative for firms facing a higher corporate tax rate. Although, in a given country, there will still be variation across firms in terms of the distribution of high-tax subsidiaries versus low-tax subsidiaries, the higher corporate tax rate a country has, the more likely it is that the majority of a firm's subsidiaries will be lower tax. Looking at Column (1) of Table 9, there is a positive coefficient on the interaction of the transfer-pricing enforcement measures and corporate tax rate, although the coefficient is not statistically significant. This indicates that, for higher-tax rate countries, the response of reported profit to increased enforcement is less negative than for lower-tax

¹⁰See, for example, Dischinger et al. (2010).

Table 8: Robustness Checks

	(1)	(2)	(3)
	Log EBIT	Log EBIT	Log EBIT
tprisk	-0.0706*** (0.0155)	-0.0236 (0.0160)	-0.0265** (0.0112)
Tax Rate	-0.639*** (0.229)	0.182 (0.346)	-0.180 (0.221)
Log Assets	0.0698*** (0.00914)	0.0951*** (0.0111)	0.0641*** (0.00816)
Log Labor	0.372*** (0.0166)	0.396*** (0.0188)	0.405*** (0.0161)
Log GDP	-1.150 (1.109)	-1.806 (1.829)	0.261 (1.347)
Log GDP ²	0.171 (0.153)	0.444* (0.255)	0.0838 (0.184)
Deficit	0.00232 (0.00302)	0.000404 (0.00356)	-0.00488** (0.00249)
Observations	73,291	44,471	90,580
Within R-squared	0.055	0.066	0.059
Number of Firms	19,841	11,488	22,731
Industry-Year F.E.	✓	✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable in all columns is the log of reported profit before interest and taxes. tprisk=index of transfer-pricing risk described in Section 4.1. Tax Rate=corporate tax rate in the firm's home country. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP. Column (1) excludes firms that are located in France, Italy and Spain. Column (2) only includes firms that are GUOs. Column (3) only includes firms that are not GUOs.

Table 9: Firms with Low-Tax Affiliates vs. Firms Without

	(1)	(2)	(3)	(4)
	Log EBIT	Log EBIT	Log EBIT	Log EBIT
tprisk	-0.0080 (0.0115)	-0.0549*** (0.0164)	-0.00979 (0.00952)	-0.0471*** (0.0358)
Tax Rate	-0.149 (0.218)	-0.150 (0.620)	-0.143 (0.220)	-0.0721 (0.605)
Log Assets	0.0690*** (0.00781)	0.0780*** (0.0146)	0.0699*** (0.00793)	0.0764*** (0.0141)
Log Labor	0.405*** (0.0155)	0.382*** (0.0232)	0.402*** (0.0156)	0.392*** (0.0227)
Log GDP	2.488* (1.409)	-2.546 (1.684)	2.203 (1.422)	-2.407 (1.666)
Log GDP ²	-0.178 (0.194)	0.420* (0.235)	-0.139 (0.196)	0.404* (0.232)
Deficit	-0.00352 (0.00274)	0.00192 (0.00333)	-0.00307 (0.00279)	0.00148 (0.00328)
Observations	98,454	36,597	96,830	38,221
Within R-squared	0.060	0.065	0.060	0.064
Number of Firms	26,536	12,454	26,178	12,996
Year-Industry F.E.	✓	✓	✓	✓
Sample of firms	Firms with lower-tax aff.	Firms with no lower-tax aff.	Firms with lower-tax sub.	Firms with no lower-tax sub.

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in all columns is the log of reported profit before interest and taxes. tprisk=index of transfer-pricing risk described in Section 4.1. Tax Rate=corporate tax rate in the firm's home country. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

countries. Given that enforcement makes shifting out more costly, it makes sense that countries which experience greater outflows, higher-tax countries, would see a more positive effect of enforcement. Similar results are found if the firm-specific average tax difference is used instead of the corporate tax rate. The model also predicts that having low-tax affiliates should make a firm’s response to an increase in transfer-pricing enforcement less negative. Column (2) includes interactions between the transfer-pricing risk measure and both the number of lower-tax affiliates a firm has and the number of higher-tax affiliates a firm has. The positive coefficient on the interaction of the number of lower-tax affiliates and *tprisk* is consistent with enforcement serving to reduce profit-shifting outflows. The fact that *tprisk* continues to maintain its negative coefficient, however, still suggests that the compliance costs of dealing with increased enforcement are large. In Column (3) of Table 10, both the number of lower-tax affiliates and higher-tax affiliates the firm has interacted with *tprisk* and indicators for if the firm has at least one lower-tax affiliate and at least one higher-tax affiliate interacted with *tprisk* are included. The results suggest that having a lower-tax affiliate makes a firm’s response to increased enforcement less negative, which is consistent with the story above. More surprisingly, it appears that having at least one higher-tax affiliate also makes the response of reported profits to increased enforcement less negative. This could capture the fact that having a higher-tax affiliate might be an indicator that the firm is part of a multinational where profit shifting occurs.

5.3 Response to affiliate-country enforcement

In addition to predicting differences across firms in the response of reported profit to own-country enforcement, the model also predicts that reported profit should be decreasing in the enforcement levels of the countries in which higher-tax affiliates are located and that the enforcement levels of countries in which lower-tax affiliates are located should have an ambiguous effect on reported profit. The first column of Table 11 adds two additional terms to the specification, the average level of enforcement in the countries of higher-tax affiliates, where *tprisk* for each affiliate is weighted by the tax differential between that country and the firm’s home country, and the average level of enforcement in the countries of lower-tax affiliates, where *tprisk* for each affiliate is again weighed by the tax differential between the firm’s home country and the tax rate faced by that affiliate. The sign on *AvgRiskHi* is consistent with the predictions of the model, but the results are not statistically significant. Partially, this could be due to the fact that the size of the subsidiary is also important in determining the response of reported profit to a change in *tprisk* in that subsidiary’s country. The opportunities for shifting are likely to be greater with larger subsidiaries, but currently, for any given tax differential, subsidiaries all receive the same weight due to the extremely limited information available on subsidiary size. In the future, affiliate *tprisk* should be weighted by affiliate-level assets for the subset of affiliates for which this information is available.

Another problem with the regression is that, by including both average risk for higher-tax affiliates and average risk for lower-tax affiliates, only the small subset of firms that have both high-tax and low-tax affiliates is used. To take into account the effect of using this subset of firms, each measure of affiliate transfer-pricing enforcement is considered separately. Only limiting the sample to firms that have at least one higher-tax affiliate, Column (2) of Table 11 shows that the coefficient on *AvgRiskHiWeight* continues to be negative, but statistically insignificant. Only limiting the sample to firms that have at

Table 10: Variation in distribution of subsidiaries

	(1) Log EBIT	(2) Log EBIT	(3) Log EBIT
tprisk	-0.112* (0.0619)	-0.109* (0.0622)	-0.110* (0.0621)
Tax Rate	-1.224 (0.884)	-1.165 (0.894)	-0.922 (0.897)
tprisk*Tax Rate	0.292 (0.215)	0.258 (0.216)	0.215 (0.217)
tprisk*NumLo		0.00540* (0.00324)	0.00504 (0.00320)
tprisk*HasLo			0.0110*** (0.000406)
tprisk*NumHi		0.00521 (0.00349)	-0.000235 (0.00327)
tprisk*HasHi			0.0133*** (0.00393)
Log Assets	0.0730*** (0.00663)	0.0729*** (0.00664)	0.0729*** (0.00664)
Log Labor	0.401*** (0.0123)	0.401*** (0.0123)	0.401*** (0.0123)
Log GDP	-0.423 (1.085)	-0.307 (1.086)	-0.165 (1.086)
Log GDP ²	0.198 (0.149)	0.180 (0.149)	0.159 (0.149)
Deficit	-0.00228 (0.00210)	-0.00229 (0.00211)	-0.00237 (0.00211)
NumLo		-0.00761 (0.0167)	-0.0174 (0.0166)
NumHi		0.00583 (0.0172)	-0.00699 (0.0167)
Observations	135,051	135,051	135,051
Within R-squared	0.061	0.061	0.061
Number of Firms	34,219	34,219	34,219
Year-Industry F.E.	✓	✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in all columns is the log of reported profit before interest and taxes. tprisk=index of transfer-pricing risk described in Section 4.1. Tax Rate=corporate tax rate in the firm's home country. NumLo=the number of lower-tax affiliates the firm has. HasLo=1 if the firm has at least one lower-tax affiliate. NumHi=the number of higher-tax affiliates the firm has. HasHi=1 if the firm has at least one higher-tax affiliate. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

least one higher-tax affiliate, Column (3) of Table 11 provides weak evidence that stricter enforcement in the countries where lower-tax affiliates are located decreases reported profit. Since a firm will have an incentive to deduct the compliance costs of transactions in the higher-tax country, this would be consistent with transfer-pricing regulation having a relatively large effect on compliance costs and a relatively small effect on the actual amount shifted out. As discussed briefly in section 4.3, the measures used in these regressions to capture enforcement in the countries in which affiliates are located will all suffer from the problem that they will also partially be capturing the effect of changes in corporate tax rates that change the weighting of *tprisk* across affiliates and that the precise form of the term will depend on the assumptions that are made about the cost functions.

6 Conclusions

This paper considers the effect of transfer-pricing enforcement on reported profits using a model of optimal profit shifting to capture how profit-shifting flows respond to changes in enforcement. The model recognizes that there are three effects of increased transfer-pricing enforcement. It deters shifting out; it can potentially deter shifting in; and it increases the cost of doing business for any firm with related-party transactions. Policy makers often seem to suggest that increased transfer-pricing regulation is always a good thing, but this indicates that they are implicitly focusing on only the first of these effects. Using a firm fixed-effects estimation strategy, the results in this paper suggest that increased transfer-pricing enforcement has a negative effect on reported profit, although the effect is less negative for firms that are located in higher-tax countries. Consistent with the predictions of the model, the effect of enforcement is also less negative for firms with low-tax affiliates, which indicates that enforcement does deter shifting out. These results mean that, even if increased regulation is costless from the perspective of the government, increased enforcement should not be automatically assumed to increase tax collections.

Both individual countries and international groups such as the OECD are increasingly focusing on preventing profit shifting. While measures to make profit shifting more costly may seem appealing, it is necessary to recognize that these measures have many effects beyond simply decreasing the amount of profit that corporations shift out. Especially for countries with relatively low corporate tax rates, the increased compliance costs that result from increased regulation and the decrease in the incentive for shifting in mean that implementing transfer-pricing regulation is likely to decrease corporate tax revenue. The empirical results suggest that, even for relatively high-tax countries, the increase in the cost of doing business for all corporations with related-party transactions may mean that many forms of increased transfer-pricing regulation do more harm than good. Forms of enforcement like documentation requirements, that are unlikely to have a large effect on the marginal cost of shifting, but are likely to result in a significant fixed cost for any firm that has transactions with its affiliates, are especially likely to decrease reported profits and, therefore, decrease tax revenues. Partially, this may suggest that the best approach to deterring profit shifting is to improve the targeting of transfer-pricing investigations rather than forcing all firms to comply with detailed documentation requirements. The more these efforts can be targeted towards the firms that are actually shifting large amounts of profit out, the more likely these measures should be to have a positive effect on tax revenue. This paper does

Table 11: Effect of Affiliate-Level Enforcement

	(1) Log EBIT	(2) Log EBIT	(3) Log EBIT
AvgRiskHi	-0.217 (0.141)	-0.122 (0.0827)	
AvgRiskLo	-0.168 (0.112)		-0.130** (0.0528)
tprisk	-0.0237 (0.0271)	-0.0350** (0.0149)	-0.0174 (0.0156)
tprisk*NumHi	0.00290 (0.00789)	-0.000793 (0.00334)	0.00585 (0.00684)
tprisk*NumLo	0.00283 (0.00357)	0.00555 (0.00338)	0.00246 (0.00334)
Tax Rate	0.957 (0.844)	0.399 (0.526)	0.0811 (0.296)
Log Assets	0.0685*** (0.0164)	0.0799*** (0.0112)	0.0715*** (0.00852)
Log Labor	0.446*** (0.0339)	0.419*** (0.0201)	0.400*** (0.0170)
Log GDP	3.038 (3.641)	-1.563 (1.557)	4.145* (2.205)
Log GDP ²	-0.445 (0.494)	0.263 (0.216)	-0.408 (0.298)
Deficit	-0.0124** (0.00525)	-0.00342 (0.00280)	-0.00525* (0.00307)
NumHi	-0.0419 (0.0345)	-0.0237 (0.0189)	-0.0267 (0.0294)
NumLo	-0.0316 (0.0208)	-0.0350* (0.0190)	-0.00869 (0.0187)
Observations	28,459	62,891	86,117
Within R-squared	0.069	0.065	0.058
Number of Firms	8,951	19,114	24,820
Industry-Year F.E.	✓	✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable in all columns is the log of reported profit before interest and taxes. AvgRiskHiWeight = weighted (by tax differential) average of the *tprisk* index of the countries of all higher-tax affiliates. AvgRiskLoWeight = weighted (by tax differential) average of the same index for the countries of all lower-tax affiliates. tprisk = index of transfer-pricing risk described in Section 4.1. Tax Rate = corporate tax rate in the firm's home country. NumLo = the number of lower-tax affiliates the firm has. NumHi = the number of higher-tax affiliates the firm has. Log Assets = $\log(\text{fixed tangible assets})$. Log Labor = $\log(\text{employee compensation})$. Log GDP = $\log(\text{per capita GDP})$. Log GDP² = $\log(\text{per capita GDP})^2$. Deficit = government deficit/surplus as a percentage of GDP.

not touch on the separate issue of how differences in enforcement across countries would be expected to affect optimal shifting between affiliates. Given that weaker efforts to prevent profit shifting are probably attractive to a firm, however, this is likely to provide further support for increased own-country enforcement reducing reported profits and, therefore, tax collections.

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Appendix A: Details on Transfer-Pricing Risk Measure

The Mescall transfer-pricing risk measure is created by regressing experts' perceptions of transfer-pricing risk on observable characteristics of transfer-pricing regulation. To create the measure, he collected data in 2010 from 76 transfer pricing experts on their perceptions of transfer-pricing risk for 27 different countries, and also information on if they believed certain characteristics of transfer-pricing policy would serve to increase or decrease transfer-pricing risk. They were asked about 14 different components of transfer-pricing regulation, 13 of which are available from Deloitte's annual transfer pricing survey and 1 of which, the use of secret comparables, is available from KPMG's annual transfer pricing survey.¹¹ In his survey he also asked the experts to assess the enforcement level for each of the countries that he was interested in. Using the survey results, he regressed the perception of transfer-pricing risk, obtained from the experts, on the 14 components of transfer-pricing regulation and the experts' measure of transfer-pricing enforcement. The 15 characteristics considered and the variable used to capture each of these characteristics are described in Table 12. Mescall's results suggest that only nine of the fifteen factors are statistically significant in determining the level of transfer-pricing risk. From his results, he estimates the following relationship:

$$\begin{aligned} tprisk = & 1.027 + (0.224)NoPriorityofMethods + (0.251)RelatedParty + (0.387)SecretComp \\ & + (0.227)NoPenaltyReduction + (0.178)TaxFirst + (0.229)NoSetoffs \\ & + (0.175)NoCCAs + (0.326)NoBenchmark + (2.794)TPAudit \end{aligned}$$

Arguably, the coefficients obtained from the regression can be used to generate a value for the level of transfer-pricing risk for both years and countries outside of the sample. Since the transfer-pricing enforcement measure obtained from the experts is not available for other years, transfer-pricing audit risk, which is available from Ernst & Young's annual transfer pricing guide is used in its place. That data needed to calculate this measure for the period between 2006 and 2011 are collected. Depending on the year, the number of countries for which the necessary information is available varies, so the set of countries ranges from 37 countries in 2006 to 53 countries in 2011. Countries that are known to have no transfer-pricing regulations a *tprisk* score of 1.03.¹²

From the initial survey, the practitioners believed that priority of methods, related-party disclosure requirements, transfer-pricing documentation requirements, contemporaneous documentation requirements, the use of secret comparables, not having transfer-pricing penalty reductions, having to pay tax first, not having related-party setoffs, not having cost contributions agreements, not having commissionaire arrangements and not allowing for the use of foreign comparables would all increase transfer-pricing risk. They believed that allowing for advanced pricing agreements, allowing for self-initiated adjustments and having benchmark data available should decrease transfer-pricing risk. The above results then, are roughly in line with the perceptions of the transfer-pricing experts. Table 13 summarizes the measure *tprisk* for each country for the years between 2006 and 2011.

Since the weights given to various aspects of a country's transfer pricing system (such as docu-

¹¹For years 2010 and earlier, this publication was called the Strategy Matrix for Global Transfer Pricing. From 2011 on, it is referred to as the Global Transfer Pricing Desktop Reference.

¹²Table 15 summarize the periods for which various countries are assumed to have had no transfer-pricing regulations in existence.

mentation requirements, the ability to use foreign comparables, if a country uses secret comparables, if advanced pricing agreements are available, and a variety of other factors) are determined based on practitioners' perceptions of risk, the *tprisk* measure should do a reasonable job of capturing the variation in transfer-pricing regulation that exists. One drawback to this measure is that it is constructed using a rather limited sample of countries, so it is not clear if the weights assigned to the different kinds of transfer pricing regulation would be expected to carry over to a broader sample of countries. To control for the fact that the coefficients found by Mescall may not be generalizable across countries or across years, an alternative measure of enforcement, *tpcost*, is also considered. The variable *tpcost* simply measures how many of the seven characteristics that are statistically significant and were expected by practitioners to increase risk (*RelatedParty*, *SecretComp*, *NoPenaltyReduction*, *TaxFirst*, *NoSetoffs*, *NoCCAs* and *NoBenchmark*) are present in a given country in a given year. The *TPAudit* variable, which is based on an individual's perception, is omitted from this measure so that it is fully based on observable characteristics. This measure is summarized in Table 14. On first glance, neither measure seems to match up particularly well with popular perceptions of the ability to detect profit shifting across countries. The United States, for example, on the seven point cost index only gets a score of one. The training and the ability of the IRS to target audits is not something that can be picked up by this measure. That might suggest that this measure is going to do a better job of capturing variation in pure compliance costs than it does capturing variation in the ability to deter profit shifting. This also speaks in favor of using *tprisk* which does at least include the audit risk term.

Both measures suffer from the problem that they cannot fully capture differences across countries in the resources that are available to the tax enforcement agency, and so they will struggle to capture variation in the risk of audit or variation in the quality of the training of those who will perform the audit. While the measure of audit risk may, in part, capture the availability of resources for a given tax agency, it is unlikely to capture variation in expertise. A recent paper, Klassen et al. (2013) also uses a survey to rank countries by the experience and expertise of their transfer pricing authorities. In future work, a measure of this nature could also be interesting to analyze. For now, however, this paper will use *tprisk* as the preferred measure of transfer-pricing enforcement.

Table 12: Transfer-Pricing Policy Characteristics

Characteristic	Description of Variable
Priority of Method	NoPriorityofMethods=1 if a country does not identify a priority of transfer-pricing methods to use
Transfer-Pricing Documentation Requirement	DocReq=1 if a country has legislation requiring transfer-pricing documentation
Contemporaneous Documentation Requirement	ContempDoc=1 if a country has a requirement that documentation be prepared at the time of transactions
Related-Party Disclosure	RelatedParty=1 if a country has a tax return that requires disclosure of related-party transactions
Availability of Benchmark Data	NoBenchmark=1 if benchmark data on prices is not available to taxpayer
Use of Foreign Comparables	NoForeignComp=1 if the government does not allow the use of foreign comparables for transfer pricing transactions
Use of Secret Comparables	SecretComp=1 if the government uses secret comparables in the calculation of “correct” transfer prices
Transfer-Pricing Penalty Reduction	NoPenaltyReduction=1 if the government does not allow for reductions in transfer-pricing penalties
Pay Tax First	TaxFirst=1 if the taxpayer is required to pay tax assessment before going to competent authority
Availability of Cost-Contribution Agreements	NoCCAs=1 if the government does not allow cost-contribution agreements
Availability of Commissionaire Arrangements	NoCommissionaire=1 if the government does not allow commissionaire arrangements
Related-Party Setoffs	NoSetoffs=1 if no bundling of transactions is allowed
Self-Initiated Adjustments	Adjust=1 if self-initiated adjustments are allowed
Availability of Advance Pricing Agreements	APA=1 if advanced pricing agreements are allowed
Audit Risk	TPAudit: ranges between .2 if audit risk is low and 1 if audit risk is high

Table 13: Transfer-Pricing Risk Measure by Country

Country	2006	2007	2008	2009	2010	2011
Argentina	3.5302	3.1775	3.7363	3.7363	4.8539	3.7363
Australia	4.2352	2.7303	3.2891	3.2891	3.2891	3.8479
Austria	4.2133	3.6525	3.0937	3.0937	4.2113	4.2113
Belgium	3.0385	3.0385	3.0385	3.2891	3.2891	3.2891
Brazil	5.1895	4.2434	4.2434	4.2434	4.2434	3.6846
Canada	4.4643	4.4643	4.4643	4.4643	4.4643	4.4643
Chile	2.5431				1.7606	4.9419
China	4.2526		4.3069	4.3069	4.8657	4.8657
Colombia	3.5096	2.9508	3.5096	3.5096	4.6272	4.6272
Czech Republic	3.4226	3.0961	3.0961	3.0961	4.2137	4.2137
Denmark	2.7303	3.8479	3.8479	3.8479	3.8479	3.8479
Ecuador		4.1463	3.914	3.6903	4.8079	5.1952
Egypt					2.0112	4.8052
Finland	3.8957	4.2278	4.2547	4.2547	4.4784	4.4784
France	4.435	4.2113	4.2113	4.2113	4.2113	4.2113
Germany	3.9846	3.9846	3.9846	4.3111	4.3111	4.3111
Greece						4.4643
Hong Kong						2.9053
Hungary	3.6634	3.6634	3.1592	3.1592	3.4098	4.5274
India	3.8969	3.8969	3.8969	3.8969	3.8969	5.0145
Indonesia					3.8999	5.0175
Ireland	2.3681				1.3565	1.9153
Israel		3.5126	3.5126	3.5126	3.5126	4.6302
Italy	4.4035	4.4035	4.4035	4.4035	4.4035	4.4035
Japan	4.0808	4.0808	3.9031	3.9031	3.9031	3.9031
Kenya						3.1105
Korea	3.8479		3.8479	3.8479	3.8479	4.0716
Luxembourg					3.1592	4.2768
Malaysia	4.7908	4.7908	4.7908	4.7908	4.7908	4.7908
Mexico	4.0746	3.6218	3.6218	3.6218	4.7394	4.7394
Netherlands	4.4643	4.688	4.688	4.688	4.688	4.688
New Zealand	4.3111	4.5348	4.3111	4.3111	4.3111	4.3111
Norway	4.2308	4.6181	4.8687	4.8687	4.8687	4.8687
Peru	3.2805	3.2805	3.2805	3.2805	3.6678	3.6678
Philippines	3.4857				4.2081	4.2081

Table 13: Transfer-Pricing Risk Measure by Country

Country	2006	2007	2008	2009	2010	2011
Poland	4.4011		4.6369	4.6369	4.6369	4.0781
Portugal	4.077	3.3467	3.3467	3.3467	3.3467	3.3467
Romania					3.2162	3.775
Russia	3.437	2.3194	2.3194	2.3194	3.8243	4.9419
Singapore	3.7242	3.3369	3.3369	3.3369	3.3369	3.3369
Slovak Republic					3.3467	3.3467
South Africa	4.8049	4.8049	4.8049	4.8049	4.5758	4.5758
Spain	3.1132	2.8865	2.3277	4.2547	4.2547	4.2547
Sweden	3.2652	4.435	4.2113	4.2113	4.2113	4.2113
Switzerland		2.9355	2.9355	2.9355	2.9355	4.2768
Taiwan	3.9748	3.9748	5.0924	5.0924	4.7051	4.7051
Thailand	3.8326	4.0563	4.0832	4.0832	4.0832	4.642
Turkey		4.9906	5.0145	5.0145	4.7908	4.7908
UK	4.1623	4.1623	4.1623	4.1623	4.1623	3.8272
Uruguay					2.2349	5.0289
US	4.0716	4.0716	4.0716	4.0716	4.0716	4.0716
Venezuela	3.2859	4.4035	4.4035	4.4035	4.4035	4.4035
Vietnam		5.4162	4.8574	5.4162	5.4162	4.8574

Table 14: Number of Transfer-Pricing Characteristics by Country

Country	2006	2007	2008	2009	2010	2011
Argentina	6	4	4	4	4	4
Australia	2	1	1	1	1	1
Austria	2	2	2	2	2	2
Belgium	0	0	0	1	1	1
Brazil	5	4	4	4	4	4
Canada	3	3	3	3	3	3
Chile	2	4	4	4	4	5
China	7	7	4	4	4	4
Colombia	3	3	3	3	3	3
Czech Republic	3	2	2	2	2	2
Denmark	1	1	1	1	1	1
Ecuador		4	5	5	5	6
Egypt		5			5	5
Finland	3	2	3	3	3	3
France	2	2	2	2	2	2
Germany	1	1	1	2	2	2
Greece						3
Hong Kong					2	2
Hungary	4	4	2	2	3	3
India				5	5	6
Indonesia	4	4	4	4	4	4
Ireland	3	2	2	2	2	2
Israel		4	4	4	4	4
Italy	3	3	3	3	3	3
Japan	4	4	3	3	3	3
Kenya						3
Korea	1	1	1	1	1	1
Luxembourg				2	2	2
Malaysia	4	4	4	4	4	4
Mexico	5	4	4	4	4	4
Netherlands	3	3	3	3	3	3
New Zealand	2	2	2	2	2	2
Norway	3	4	5	5	5	5
Peru	2	2	2	2	3	3
Philippines	3	3	4	4	4	4
Poland	3	3	4	4	4	4
Portugal	2	3	3	3	3	3

Table 14: Number of Transfer-Pricing Characteristics by Country

Country	2006	2007	2008	2009	2010	2011
Romania					1	1
Russia	4	4	4	4	5	5
Singapore	4	3	3	3	3	3
Slovak Republic					3	3
South Africa	4	4	4	4	3	3
Spain	3	2	3	3	3	3
Sweden	1	2	2	2	2	2
Switzerland		2	2	2	2	2
Taiwan	5	5	5	5	4	4
Thailand	3	3	4	4	4	4
Turkey		4	4	4	4	4
UK	2	2	2	2	2	2
Uruguay					5	5
US	1	1	1	1	1	1
Venezuela	3	3	3	3	3	3
Vietnam		6	6	6	6	6

Table 15: Existence of Transfer-Pricing Regulation

Country	No TP Regulation	Country	No TP Regulation
Algeria	2003-2010	Liberia	2003-2011
Andorra	2003-2011	Libya	2003-2011
Anguilla	2003-2011	Macau	2003-2011
Armenia	2003-2011	Macedonia	2003-2007
Angola	2003-2010	Malawi	2003-2007
Aruba	2003-2007	Mali	2003-2011
Bahamas	2003-2011	Mauritania	2003-2011
Bangladesh	2003-2011	Mongolia	2003-2011
Belarus	2003-2011	Morocco	2003-2008
Bolivia	2003-2011	Mozambique	2003-2009
Bosnia and Herzegovina	2003-2006	Namibia	2003-2005
Botswana	2003-2011	Netherland Antilles	2003-2009
Brunei	2003-2011	Nicaragua	2003-2011
Burkina Faso	2003-2011	Nigeria	2003-2011
Cambodia	2003-2011	Oman	2003-2009
Cameroon	2003-2010	Pakistan	2003-2011
Cayman Islands	2003-2011	Panama	2003-2010
Costa Rica	2003-2011	Papua New Guinea	2003-2011
Cote d'Ivoire	2003-2011	Paraguay	2003-2011
Cyprus	2003-2011	Puerto Rico	2003-2010
Dominican Republic	2003-2010	Qatar	2003-2011
Ecuador	2003-2004	Senegal	2003-2011
Egypt	2003-2004	Sierra Leone	2003-2011
Ethiopia	2003-2011	Sri Lanka	2003-2009
Gambia	2003-2011	Swaziland	2003-2011
Georgia	2003-2010	Syria	2003-2011
Ghana	2003-2010	Trinidad and Tobago	2003-2011
Honduras	2003-2011	Tunisia	2003-2011
Iraq	2003-2011	Turkey	2003-2006
Jamaica	2003-2011	Uganda	2003-2010
Kuwait	2003-2011	United Arab Emirates	2003-2011
Lesotho	2003-2011	Zimbabwe	2003-2011

Appendix B: Alternative Measure of Enforcement

Since it is the most readily available measure and also the most used in previous papers, in this appendix a measure of documentation that expands on a measure created in Lohse et al. (2012) is also considered. In their paper, they create a measure that places a country in a category between 0 and 5, depending on the strictness of its transfer-pricing documentation requirements. Countries in category 0 have no transfer pricing regulations. Countries in category 1 have regulation that introduces the arm's length principle but have no documentation requirements. Countries in category 2 do not have legislation on documentation requirements, but documentation is required to exist in practice. Countries in category 3 have documentation requirements introduced in national law, but the submission of documentation is only required on request. Countries in categories 4 and 5 require automatic disclosure of documentation, with category 4 countries requiring a short form and category 5 countries requiring a long form. In this section, the measure is extended to include years between 2003 and 2012. The information is obtained from a combination of Ernst & Young Transfer Pricing Global Reference Guides, Deloitte Transfer Pricing Country Guides, KPMG Global Transfer Pricing Reviews and PwC International Transfer Pricing publications.¹³ For the period from 2003 to 2012, Table 16 summarizes the minimum enforcement level observed and the maximum enforcement level observed for each country. The distribution of the firms in the sample (described in Section 4.3) across the different documentation categories is detailed in table 17. The large decrease in category zero firms from 2003 to 2004 is caused by Belgium implementing transfer pricing legislation in 2004. The increase in category 4 firms in 2008 is largely due to Norway moving up to category 4 in 2008. Overall, there is a clear trend towards having statutory documentation requirements (categories 3 and above) over the time period being considered. As can be seen from Table 16, many countries change categories between 2003 and 2011, so it seems like there is the potential for enough within-country variation to identify the effect of changes in enforcement in the firm fixed-effects framework.

Recognizing both that difference across these categories might be small in practice and that few firms are located in category 0 or category 5 countries, the measure used in the regressions that follow places countries into three different categories, where a country is classified as category 0 if there is no documentation requirement at all (categories 0 or 1 of the original index), category 1 if there is no statutory documentation requirement but there is a documentation requirement in practice (category 2 of the original index) and category 2 if there is a statutory documentation requirement (categories 3, 4 and 5 of the original index). If there is evidence that a country has no transfer-pricing regulation in place, then, for this three category classification, the country is assigned to category 0. A summary of the countries that this rule is applied for is in Table 15. The only exception to this rule is Switzerland, which, although it has no official transfer-pricing regulation, follows OECD guidelines and so receives a documentation requirement score of 2 for all years between 2003 and 2012.

Replicating the baseline results obtained using the transfer-pricing risk index in Table 6, Table 18 indicates that increases in documentation requirements have also been associated with a reduction in reported profits. Column (1) of Table 19 indicates that the effect of increased enforcement is again less negative for higher-tax rate countries, which is consistent with documentation requirements reducing outflows. The limited variation in transfer-pricing documentation requirements over time,

¹³For earlier years, the Deloitte publication is referred to as the Strategy Matrix for Global Transfer Pricing.

Table 16: Documentation Requirement Measure by Country

Country	Min. Enforce	Max. Enforce	Country	Min. Enforce	Max. Enforce
Argentina	5	5	Lithuania	3	3
Australia	4	4	Luxembourg	2	2
Austria	2	2	Malaysia	4	4
Azerbaijan	2	2	Mexico	5	5
Belgium	0	2	Moldova	2	2
Brazil	5	5	Montenegro	2	2
Bulgaria	1	2	Namibia	2	2
Canada	4	4	Netherlands	4	4
Chile	1	1	New Zealand	2	2
China	4	5	Norway	3	4
Columbia	2	5	Panama	1	3
Croatia	1	3	Peru	2	5
Czech Republic	2	2	Philippines	1	2
Denmark	4	4	Poland	4	4
Dominican Republic	0	3	Portugal	4	4
Ecuador	0	5	Qatar	2	2
Egypt	0	3	Romania	2	3
El Salvador	0	2	Russia	2	3
Estonia	0	4	Saudi Arabia	2	2
Finland	2	3	Serbia	2	2
France	2	3	Singapore	2	2
Georgia	1	1	Slovak Republic	2	3
Germany	3	3	Slovenia	4	4
Greece	1	4	South Africa	2	3
Hong Kong	1	3	Spain	2	3
Hungary	3	4	Sweden	2	3
Iceland	1	1	Taiwan	4	4
India	4	4	Tanzania	2	2
Indonesia	4	5	Thailand	2	2
Ireland	1	3	Turkey	4	4
Israel	1	4	Ukraine	1	1
Italy	4	4	United Kingdom	3	3
Japan	4	4	US	4	4
Kazakhstan	2	3	Uzbekistan	0	1
Kenya	1	2	Uruguay	1	3
Korea	3	4	Venezuela	4	4
Latvia	1	2	Vietnam	2	3
Lebanon	1	1	Zambia	2	2

Table 17: Summary of documentation requirement measure for sample used

	2003	2004	2005	2006	2007	2008	2009	2010	2011
0	12.38 %	1.37%	1.01%	1.22%	0.01%	0.01%	0.00%	0.00%	0.00%
1	1.25%	1.30%	0.38%	0.67%	0.95%	0.58%	0.54%	0.61%	0.07%
2	49.44%	57.71%	57.94%	56.66%	31.56%	29.24%	26.65%	13.99%	14.25%
3	14.75%	15.51%	18.60%	19.21%	43.70%	37.50%	40.05%	52.26%	52.19%
4	21.67%	23.42%	22.07%	22.23%	23.46%	32.35%	32.40%	32.83%	33.49%
5	0.00%	0.00%	0.01%	0.00%	0.00%	0.01%	0.02%	0.02%	0.02%
Missing	0.52%	0.69%	0.00%	0.01%	0.32%	0.31%	0.34%	0.30%	0.28%

Note: The countries with at least one year of missing information on enforcement are Bosnia and Herzegovina, Liechtenstein, Malta, Morocco and Slovakia.

however, means that it is not possible to identify a heterogenous response by the distribution of a firm's affiliates. Column (2) suggests that having more lower-tax affiliates makes the response to increased documentation less negative, but it is very small and statistically insignificant.

Table 18: Baseline Regressions-Documentation Measure

	(1)	(2)	(3)
VARIABLES	Log EBIT	Log EBIT	Log EBIT
Doc Req=1	0.0295*** (0.00986)	-0.0309*** (0.0112)	-0.0312*** (0.0113)
Doc Req=2	0.0364 (0.0255)	-0.0660** (0.0279)	-0.0678** (0.0283)
Tax Rate			0.0671 (0.167)
Log Assets	0.107*** (0.00502)	0.0932*** (0.00514)	0.0933*** (0.00514)
Log Labor	0.473*** (0.00886)	0.432*** (0.00928)	0.432*** (0.00928)
Log GDP		-0.773** (0.374)	-0.756** (0.375)
Log GDP ²		0.202*** (0.0556)	0.199*** (0.0557)
Deficit		-0.000153 (0.00187)	-4.97e-05 (0.00190)
Observations	196,350	194,433	194,433
Within R-squared	0.103	0.118	0.118
Number of Firms	36,760	36,444	36,444
Industry-Year F.E.		✓	✓

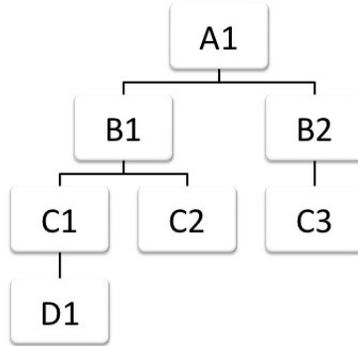
Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in all columns is the log of reported profit before interest and taxes. Doc Req=1 indicates the firm's home country is in category 2 of the documentation requirement measure that is discussed in this appendix, Doc Req=2 indicates the firm's home country is in category 3, 4 or 5. Tax Rate=corporate tax rate in the firm's home country. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

Table 19: Heterogeneous Response-Documentation Measure

VARIABLES	(1)	(2)
	Log EBIT	Log EBIT
Doc Req=1	0.00822 (0.0619)	-0.000237 (0.0628)
Doc Req=2	-0.393*** (0.0860)	-0.393*** (0.0881)
Tax Rate	-0.219 (0.222)	-0.242 (0.228)
Doc Req=1*Tax Rate	-0.151 (0.197)	-0.141 (0.200)
Doc Req=2*Tax Rate	1.252*** (0.289)	1.171*** (0.292)
Doc Req=1*NumLo		0.000298 (0.00146)
Doc Req=2*NumLo		0.00706 (0.00537)
Doc Req=1*NumHi		0.00556 (0.00594)
Doc Req=2*NumHi		-0.00321 (0.00961)
Log Assets	0.0938*** (0.00514)	0.0937*** (0.00514)
Log Labor	0.433*** (0.00928)	0.433*** (0.00928)
Log GDP	-0.587 (0.374)	-0.565 (0.376)
Log GDP ²	0.147*** (0.0560)	0.143** (0.0561)
Deficit	0.00247 (0.00193)	0.00245 (0.00193)
Observations	194,433	194,433
Within R-squared	0.119	0.119
Number of Firms	36,444	36,444
Industry-Year F.E.	✓	✓

Note: Firm fixed-effects regression. Standard errors clustered at the firm level are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable in all columns is the log of reported profit before interest and taxes. Doc Req=1 indicates the firm's home country is in category 2 of the documentation requirement measure, Doc Req=2 indicates it is in category 3, 4 or 5. Tax Rate=corporate tax rate in the firm's home country. NumLo=the number of lower-tax affiliates the firm has. NumHi=the number of higher-tax affiliates the firm has. Log Assets=log(fixed tangible assets). Log Labor=log(employee compensation). Log GDP=log(per capita GDP). Log GDP²=log(per capita GDP)². Deficit=government deficit/surplus as a percentage of GDP.

Figure 1: Structure of a Hypothetical Multinational Corporation



Appendix C: Details on Corporate Group Membership

Figure 1 shows the structure of a hypothetical multinational firm. Assume, for now, that each firm is located in a different country and that it is fully owned by the firm above it. In that case, the sample could include any of the firms outside of *C2*, *C3* and *D1*. By pulling information on all foreign subsidiaries and foreign shareholders, all shifting opportunities are captured for affiliate *A1*. For other affiliates, however, the opportunities for shift across the different branches of the multinational are not captured. For affiliate *B1*, for example, only the opportunities to shift profits to or from affiliates *A1*, *C1*, *C2* and *D1* are captured, potential shifting with *B2* or *C3* will not be captured. In terms of how they would appear in the data, firm *A1* is different from the other firms in the group in that it would be listed as its own global ultimate owner (GUO). The current dataset will fully capture shifting opportunities for GUOs, but may miss some affiliate links for Non-GUOs. Approximately 35% of the firms in the sample are GUOs.

The information from ORBIS on ownership links is static. Although information is available on what year the information on the subsidiary or shareholder was obtained, there is no way of knowing if a firm is linked to its subsidiaries and shareholders in all years that it appears in the sample. The model suggests that the number of higher-tax affiliates a firm has and the number of lower-tax affiliates a firm has are important in determining the response of reported profits to a change in own-country enforcement. For these purposes, it is assumed that set of subsidiaries and shareholders remains constant for all years between 2006 and 2011. While this may not perfectly reflect the composition of the multinational over time, it should do a reasonable job. Even holding constant the firm's set of shareholders and subsidiaries, the number of higher-tax affiliates and the number of lower-tax affiliates a firm has will vary because of changes in corporate tax rates. When including information on the level of transfer-pricing enforcement in the countries where affiliates are located, it is again assumed that the firm is linked to all of its affiliates for all years in which data is available. In the future work, it might be possible to use archival data from ORBIS to better capture ownership links over time.