

# Corporate Income Tax Burdens at Home and Abroad

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## ABSTRACT

To our knowledge, this paper provides the most comprehensive analysis of firm-level corporate income tax burdens to date. We use publicly available financial statement information to estimate firm-level average effective tax rates (AETRs) for 10,642 corporations from 85 countries from 1988 to 2007. We find that, on average, AETRs declined by six percentage points or 18% over the period with much of the decline occurring from 1992 to 1994. German, Japanese, Australian and Canadian decreases were large. American, British, and French declines were more modest. Nonetheless, because AETRs were falling worldwide, the ordinal rank from high-tax countries to low-tax countries changed little. Japanese firms always faced the highest AETRs. The AETRs for tax havens and countries from the Middle East and Asia (ignoring Japan) were always lower than those for the U.S. and European countries. Multinationals and companies operating in only one country had similar AETRs. These findings should provide some empirical underpinning for ongoing policy debates about the taxation of multinational profits.

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## Corporate Income Tax Burdens at Home and Abroad

### 1. Introduction

This paper estimates average effective tax rates (AETRs) using financial statement information from 10,642 corporations domiciled in 85 countries and having subsidiaries in 195 countries from 1988 to 2007.<sup>1</sup> These AETRs enable us to compare within and across countries the tax burdens faced by domestic-only firms and multinationals and to assess the extent to which the location of foreign subsidiaries affects the worldwide tax burdens of multinationals. Tests are conducted across years and industries.

The purpose of this study is to illuminate an ongoing worldwide debate about the taxation of international commerce. At the beginning of our investigation period (1988), the taxation of multinationals was an obscure area of the law, understood by few practitioners, rarely mentioned in policy circles, and ignored by academe. Today, globalization has made the taxation of international commerce relevant to most businesses, central to policy discussions about jobs, trade, and competitiveness, and an area of interest to scholars in economics, finance, accounting, law, and related fields.

International tax policy changes are being proposed and implemented around the globe. In December, 2008, the UK and Japan decided to revamp their international tax law by shifting from a worldwide tax system to a territorial tax system. In the same month, an advisory panel formed by the Canadian Minister of Finance recommended multinational-friendly changes to its international tax law (see Advisory Panel on Canada's System of International Taxation, 2008). All three countries claimed to be attempting to enhance the competitiveness of their multinationals. Meanwhile, in the U.S., many are calling for similar reforms, questioning whether longstanding American policy toward the taxation of international business is in the best interest of the country (see Tuerff, et al. (2008), Clausing and Aviyonah (2007), and The President's Advisory Panel on Federal Tax Reform (2005), among many others).

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<sup>1</sup> Accountants define effective tax rates as income tax expense divided by net income before taxes, both figures coming from a company's income statement. In this paper, we term this ratio, "average effective tax rate," to distinguish it from "marginal effective tax rate," a term used by economists to measure investment incentives (Fullerton, 1999).

The purpose of this paper is to provide some empirical underpinning for these important policy discussions by estimating the tax expenses incurred at the parent and subsidiary level by multinationals around the globe. Although we recognize that numerous economic, social, and political forces have motivated the need for this documentation, it is beyond the scope of this paper to list the many changes in investment, technology, trade, and labor that have accelerated the development of a global economy and exacerbated the inherent difficulty that any single government faces in attempting to tax companies that service these multinational markets. Furthermore, it also is beyond the scope of this paper to detail how countries have revised their tax laws in recent years to continue to collect revenue while maintaining or increasing their share of the global economy, to list the numerous tax plans devised in response to these legislative changes, to discuss the difficulties of communicating this complex area of tax law in the political arena, or to review the literature of international tax research. Instead, we will mention a few recent events concerning the taxation of multinationals that should suffice for demonstrating the current interest in multinational taxation and the contribution that this study makes in providing some empirical facts about the extent to which the location of a company affects the taxes that it pays.<sup>2</sup>

To start, U.S. President Barack Obama ran on a tax plan that included “...reforming deferral to end the incentive for companies to ship jobs overseas.”<sup>3</sup> Ignoring the merits of this proposal, such policy statements imply that U.S.-based multinationals somehow benefit unfairly from a tax system with perverse incentives. Johnston (2008), a prominent reporter, commentator, and critic of U.S. taxes, agrees, stating that “...very few grasp how corporate taxes favor multinationals over domestic firms.”

In contrast, the managers of many U.S.-based multinationals often assert that the U.S. tax system places them at a competitive disadvantage compared with multinationals in other countries. They often

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<sup>2</sup> By “location,” we mean the location of the firm for tax purposes, also known as domicile. There is no standard definition of domicile. For example, domicile is the legal residence or site of incorporation in the U.S., but the location of operational headquarters in the UK. Throughout the paper, we will refer to a company’s location, home, or base to denote its tax domicile.

<sup>3</sup> See [http://www.barackobama.com/pdf/taxes/Factsheet\\_Tax\\_Plan\\_FINAL.pdf](http://www.barackobama.com/pdf/taxes/Factsheet_Tax_Plan_FINAL.pdf)

point to the relatively high U.S. statutory tax rate as evidence of the competitive disadvantage.<sup>4</sup> They call for reform of the U.S. taxation of multinational profits to reflect current global business conditions, although no consensus exists in the business community about the changes that should be made. Consistent with claims that companies based outside the U.S. enjoy more favorable tax conditions (at least for their American operations), the U.S. Government Accountability Office (2008) recently concluded that U.S. companies owned by foreigners pay less U.S. tax than do U.S. companies controlled by Americans.

Meanwhile, during much of 2008, British firms were not just complaining about the tax system, they were abandoning it for homes with more favorable tax treatment (*The Economist*, 2008). The Henderson Group, Charter, Shire, WPP, and the United Business Media emigrated to Ireland and the Regus Group to Luxembourg reportedly to escape high taxes on foreign profits for multinationals based in the UK (Werdigier, 2008 and Faith, 2008). Kingfisher, Brit Insurance, RSA Insurance, and Prudential, among others, threatened to leave (Werdigier, 2008, Braithwaite, 2008). In fact, the *Financial Times* (September 21, 2008) quoted an anonymous source saying, “As we understand it, half the FTSE 100 is looking at this [redomiciling outside the UK.]” (Braithwaite, 2008).

One of those exited British firms is Invesco, which moved its home for tax purposes to Bermuda (a tax haven) in December 2007. It was explicit about the influence of international tax considerations. Although the S&P 500 company is headquartered in Atlanta, it moved its tax home to Bermuda, rather than the U.S. According to Invesco’s Chief Administrative Officer, Colin Meadows, “...we wanted to make sure the transaction in moving our domicile was tax neutral for our shareholders. Moving to the

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<sup>4</sup> In the September 26, 2008, U.S. Presidential debate, Republican Presidential candidate Senator John McCain expressed these views about statutory tax rates, stating “Right now, American business pays the second-highest business taxes in the world, 35 percent. Ireland pays 11 percent. Now, if you’re a business person, and you can locate any place in the world, then, obviously, if you go to the country where it’s 11 percent tax versus 35 percent, you’re going to be able to create jobs, increase your business, make more investment, et cetera. I want to cut that business tax. I want to cut it so that businesses will remain in—in the United States of America and create jobs.” His opponent, Senator Barack Obama, countered, “Now, John mentioned the fact that business taxes on paper are high in this country, and he’s absolutely right. Here’s the problem: There are so many loopholes that have been written into the tax code, oftentimes with support of Senator McCain, that we actually see our businesses pay effectively one of the lowest tax rates in the world.”

U.S. would not have been a tax neutral situation. When it came down to it, it was a very short list of places that we considered and Bermuda was at the top.” (Neil, 2007).<sup>5</sup>

The recent British departures may be receiving undue attention in the same way that a few American inversions (reincorporations in low-tax countries with no operational impact) several years ago became highly controversial (in particular, Stanley Works’ aborted move to Bermuda in 2002). The more significant losses (both in number and pounds) may be those newly formed companies that in the past would have established their headquarters in the UK but instead are domiciling outside the UK from their inception. Since these “departures” are unobservable, they mainly escape attention, though their impact may be larger and longer-lasting. Furthermore, some companies already based in (perceived to be) tax-disfavored countries, such as the UK and the U.S., claim that they wish that they had never incorporated there and would leave, except for the high tax, political and other costs of exiting.<sup>6</sup>

Not all developed countries host unhappy multinationals. Dutch multinationals, particularly following enactment of the 2007 Corporate Income Tax Law, reportedly are paying little, if any, tax. Of the twenty largest Dutch companies, allegedly fewer than five are paying any corporate income tax to the Netherlands (Dohmen, 2008). Consistent with favorable treatment of Dutch multinationals, one international tax expert, Timothy McDonald, Vice President of Finance and Accounting for Procter & Gamble, recently identified the Netherlands as having the model system for taxing multinationals (Tuerff, et al., 2008, p.79).

Other countries have recently followed the Dutch lead. In late 2008, both the British and Japanese governments moved to exempt dividends paid from foreign subsidiaries. The changes shift both

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<sup>5</sup> Interestingly, Invesco has 5,500 employees in 19 countries, but neither office nor employees in Bermuda. Desai (2008) discusses this increasingly common separation of a multinational’s headquarters, tax home, and operations, which he terms the decentering of the global firm. In this paper, we may miscode a country’s tax home if its tax home differs from the location provided in the company’s financial records.

<sup>6</sup> Their ongoing dissatisfaction is reminiscent of the testimony of Bob Perlman, Vice President of Taxes for Intel Corporation, before the Senate Finance Committee in March, 1999, where he stated, “...if I had known at Intel’s founding (over thirty years ago) what I know today about the international tax rules, I would have advised that the parent company be established outside the U.S. This reflects the reality that our Tax Code competitively disadvantages multinationals simply because the parent is a U.S. corporation.” (Perlman, 1999). Indicative of the heated nature of this topic, the Senate Finance Committee’s ranking Democrat, New York Senator Daniel Patrick Moynihan retorted, “So money matters more to you than country?” (United States Senate Committee on Finance, 1999, p.17.)

countries from a worldwide system of taxation to a territorial system, leaving the U.S. as the only major country with a worldwide system.<sup>7</sup>

In the UK case, the Treasury stated that “The policy objective is to enhance the competitiveness of the UK by providing the widest possible exemption.” Chris Morgan of KPMG called the proposal, “...a decisive shift towards a territorial tax system where the UK only taxes profits made in the UK.” However, Ian Brimicombe, head of tax at AstraZeneca, doubted that the change in the law would bring back the firms that had already exited the UK and noted that companies with intellectual property or finance subsidiaries were still disadvantaged in the UK. (Houlder, 2008). Nonetheless, UK multinationals widely welcomed the exemption of foreign dividends.

Favorable tax treatment for multinationals inevitably leads to concerns that smaller domestic firms are paying a disproportionate share of the taxes. For example, after the HM Revenue and Customs National Audit Office (2007) reported that a third of the UK’s 700 largest companies paid no tax in the 2005-2006 financial year, Bill Dodwell of Deloitte stated, “That 700 of the largest companies and groups are only paying 54 per cent of corporation tax shows the giant contribution of small companies. It is probably because many are less international and so have different planning opportunities.” (Houlder, 2007).

Now we have come full circle. Perceptions that multinationals are not paying their fair share of taxes because they can avail themselves of tax planning opportunities not available to smaller firms fuel calls for policy change, such as those proposed by the Obama campaign. As this smattering of recent events shows, the taxation of multinationals is controversial and politically charged with implications for a country’s ability to compete for capital, investment, and labor. This paper aims to provide facts for the ongoing debate by documenting the AETRs faced by domestic-only firms, multinationals, and foreign subsidiaries around the globe and over many years.

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<sup>7</sup> In overly simplistic terms, countries with territorial systems only tax the domestic income of companies based in their country. In contrast, countries with worldwide systems tax all income (domestic and foreign) of their home companies and provide foreign tax credits to prevent double taxation of foreign profits.

To estimate the AETRs for multinationals around the globe, we regress firm-level AETRs on categorical variables for the home of the parent and whether the company is a multinational. The regression coefficients on the categorical variables provide estimates of country-level AETRs for both domestic firms, i.e., those operating in the home country only, and multinationals, i.e., those based in the home country but operating in at least one other country. These AETR estimates enable comparisons of domestics with multinationals within countries and across countries, industries, and years. We then conduct similar regressions adding categorical variables that denote the location of the firm's foreign subsidiaries. These tests enable us to compare the tax burdens of foreign subsidiaries.

We find that multinationals and domestic firms have similar AETRs. Japanese firms always face the highest tax rates. The AETRs for companies in tax havens and Middle Eastern and Asian (setting aside Japan) countries are always lower than those for firms based in the U.S. and Europe. We also find a worldwide decline in AETRs. From 1989 to 2006, AETRs, on average, dropped six percentage points or 18%, though much of the decline was from 1992 to 1994. German, Japanese, Australian and Canadian AETRs decreased more than American, British, and French AETRs. Nevertheless, because the AETRs were falling for all countries, the ordinal rank from high-tax countries to low-tax countries changed little. We also find some evidence that the location of a foreign subsidiary affects a multinational's worldwide tax burden.

To our knowledge, this paper provides the most comprehensive analysis of international firm-level corporate income tax burdens to date. Collins and Shackelford (1995) studied parent AETRs for four countries (Canada, Japan, the UK, and the U.S.) and ten years (1982-1991). Their subsequent study, Collins and Shackelford (2003), added Germany and investigated AETRs from 1992-1997; however, with data for only eight Japanese firm-years and 36 German firm-years, they were effectively limited to studying three countries. In both studies, they conclude that the parents of multinationals based in the U.S. and the UK faced similar AETRs, both of which exceeded the parent AETRs in Canada. In neither study did they have information about the location of the company's subsidiaries.

Recent advances in computer-readable financial statement datasets enable us to study far more companies (both at the parent and subsidiary level), countries, and years than Collins and Shackelford could study. A concurrent study with access to even more U.S. companies than our study is Dyreng and Lindsey (2009). They use text-searching software to collect subsidiary information for all U.S.-incorporated firms in the Compustat database between 1995 and 2007. Using a novel regression methodology to estimate the average worldwide, federal, and foreign tax rates on worldwide, federal, and foreign pre-tax income, they find that U.S. firms with subsidiaries in tax havens have average tax rates approximately 1.5 percentage points lower than U.S. firms with no subsidiaries in tax havens. A limitation of their study is that they do not have access to data for companies located outside the U.S. In contrast, our access to financial statement information for thousands of firms from scores of countries enables us to substantially expand our understanding of corporate tax burdens around the world. While our findings cannot identify the appropriate international tax policy, the AETR estimates in this study should prove useful quantitative information as policymakers, business, and scholars around the globe grapple with the complexities surrounding the taxation of multinational activities.

This paper is organized as follows: Section 2 develops the regression equation used to estimate the AETRs. Section 3 details the sample selection. Sections 4 and 5 present the empirical findings. Closing remarks follow.

## **2. Regression Equation**

To compare the tax burdens of multinationals and domestic firms across countries and to determine whether multinationals and domestics in the same country face different tax burdens, we estimate a modified version of the pooled, cross-sectional regression equation developed in Collins and Shackelford (1995):<sup>8</sup>

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<sup>8</sup> Collins and Shackelford's (1995) regression model includes categorical variables indicating whether the firm's income statement is consolidated or restated in accordance with U.S. GAAP. We exclude all unconsolidated firm-years from our sample to avoid potentially including both parents and their subsidiaries as separate observations. We cannot include the restatement variable because our data do not include it.

$$\begin{aligned}
AETR_{it} = & \sum \beta_{0j} COUNTRY_{it}^j + \sum \beta_{1j} (COUNTRY_{it}^j * MN_{it}) \\
& + \sum \beta_{2k} INDUSTRY_{it}^k + \sum \beta_{3m} YEAR_{it}^m + \sum \beta_{4n} SIZE_{it}^n + \varepsilon_{it} \quad (1)
\end{aligned}$$

where:  $AETR_{it}$  = the average effective tax rate for firm  $i$  in year  $t$ .

$COUNTRY_{it}^j$  = an indicator variable equal to 1 if firm  $i$  is based in country  $j$  in year  $t$ , equal to 0 otherwise.

$MN_{it}$  = an indicator variable equal to 1 if firm  $i$  has a foreign subsidiary in year  $t$ , equal to 0 otherwise.

$INDUSTRY_{it}^k$  = an indicator variable equal to 1 if firm  $i$  is identified as being in industry  $k$  (by two-digit NAICS) in year  $t$ , equal to 0 otherwise.<sup>9</sup>

$YEAR_{it}^m$  = an indicator variable equal to 1 for firm-years for which  $t = m$ , equal to 0 otherwise.

$SIZE_{it}^n$  = the percentile rank of the size of variable  $n$  for firm  $i$  in year  $t$ .  $n = \{\text{Assets, Revenue, Owners' Equity}\}$ .

We suppress the intercept so that the coefficients on the *COUNTRY* variables can be interpreted as the marginal cost of domiciling in a country, i.e., the average effective tax rate for domestic firms.<sup>10</sup> Throughout the paper, we refer to the coefficient on the *COUNTRY* variable as the *domestic AETR*. Suppressing the intercept also means that the coefficient on the *COUNTRY\*MN* variables is the incremental tax cost for multinationals (as compared with the domestics) in that country. Throughout the

<sup>9</sup> Inferences hold when we use two-digit SIC as the industry classifier.

<sup>10</sup> To estimate equation (1), one industry and one year have to be excluded from the regression. To determine which industry to leave out, we calculate the mean *AETR* in each industry (two-digit NAICS) in the Osiris post-2002 sample and then determine the median of those means. The industry with the median mean (code 31) is the one left out. We implement a similar procedure on the years, resulting in 2005 being the excluded year. To improve comparability across estimations, we exclude the same industry and year from each regression.

paper, we refer to the sum of the coefficients on the *COUNTRY* and the *COUNTRY \* MN* variables as the *multinational AETR*.<sup>11</sup>

With regards to the control variables, we follow Collins and Shackelford (2003), using categorical variables to capture tax differences across industries (*INDUSTRY*) and time (*YEAR*). We also introduce three control variables (*SIZE*) to capture any systematic differences in tax rates related to firm size: the percentile ranks of Total Assets, Revenues, and Equity.<sup>12</sup>

The ideal dependent variable in this study would require access to the firm's actual taxes paid and the income earned in all countries and all years. Unfortunately, such information is not publicly available. Thus, to approximate the numerator for AETRs, we turn to the total worldwide income tax expense in the company's publicly available financial statements.<sup>13</sup> In subsequent tests, we use the current income tax expense, which is available for some firms, as the numerator. We find that inferences are unaffected.

The denominator is net income before income taxes (NIBT). Since financial reporting rules vary across countries and thus affect the computation of NIBT, we conduct sensitivity tests using total revenues and an adjusted net income as denominators.<sup>14</sup> Results are qualitatively the same.

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<sup>11</sup> Note that the magnitude of the domestic and multinational AETRs cannot be directly compared with the actual AETRs from the financial statements, which serve as the dependent variable. The domestic and multinational AETRs are the tax rates, conditional on industry, year, and size. That said, our empirical analysis will show that the estimated AETRs are very similar to the actual AETRs from the financial statements.

<sup>12</sup> We use percentile ranks rather than actual values or logarithms to mitigate concerns about the accuracy of the foreign exchange and unit data. We converted all dollar variables to millions of U.S. dollars using the currency and unit data in the Osiris database. However, there appear to be errors in the data for a few countries, e.g., some of the Italian data, which the database claims is expressed in Euros, appear to be expressed in Italian Lira. Also in a few cases, data appear to be expressed in thousands although Osiris asserts that they are expressed in millions. By using percentile ranks, we limit the impact of these possible errors on our size controls.

<sup>13</sup> The calculation of profits on a firm's income statement includes a reduction for total worldwide corporate income tax expense. Unfortunately, the total tax expense is *not* the taxes paid during the year by the firm. Rather it is the amount of taxes paid in past and current years or expected to be paid in future years attributed to activity during the current year. Nevertheless, because of its public availability, the total income tax expense has been used in many studies to approximate actual taxes paid (see discussion in Graham, Raedy and Shackelford, 2008).

<sup>14</sup> To test the sensitivity of our findings to the selection of NIBT as the scalar, we follow Collins and Shackelford (1995) and use two other profit measures to scale the total income tax expense: adjusted net income (NIBT plus certain key expenses); and revenues. Adjusted net income is intended to add back some key expenses whose accounting rules vary across countries, namely depreciation expense and research and development expense (they also add back pension expense, but we do not because our data source, Osiris, does not collect that item). The second scalar, revenues eliminates any cross-country variation in expenses.

Note that the AETRs in this study are not marginal tax rates, as detailed in Scholes, et al., 2009. They ignore implicit taxes, cannot assess who bears the burden of corporate income taxes, and cannot capture incentives to employ new capital (see Fullerton, 1980, and Bradford and Fullerton, 1981, for a discussion of marginal effective tax rates). Rather, the AETRs used in this study provide an estimate of the tax expense incurred on each dollar of accounting profits.

### 3. Sample

We use the Osiris database to collect a sample of firms for this study. To collect information about the parents for all firm-years between 1988 and 2007, we access the data through the Wharton Research Data Services (WRDS) interface. Following Collins and Shackelford (1995), we attempt to mitigate the impact of outliers and errors in the data by deleting all observations for which any one of the following are true: (a) AETR exceeds 70%, (b) AETR is negative, (c) the ratio of total income tax expense to a modification of NIBT (adding back depreciation and research and development expense) is negative or exceeds 70%.<sup>15</sup>

Information about the subsidiaries of these firms is accessed through an Internet interface with Bureau van Dijk. We obtain information about subsidiaries classified in levels 1 through 10.<sup>16</sup> Thus, if a firm has a domestic subsidiary (level 1), which has a domestic subsidiary (level 2), which has a domestic subsidiary (level 3) and so forth until the domestic subsidiary in level 9 has a foreign subsidiary (level 10), we would treat that firm as a multinational and code that country as having a foreign subsidiary.

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<sup>15</sup> We eliminate firm-years with (a) missing values for firm identifier (`os_id_number`), sales (`data13002`), tax expense (`data13035`), and NIBT (`data13034`), (b) nonpositive sales, and (c) negative values for depreciation, and research and development expenses. All missing values for depreciation, and research and development expense are set to zero. We delete all observations where NIBT plus depreciation and research and development expense is zero because we use this alternative AETR denominator in some robustness tests.

<sup>16</sup> Over two-thirds of the firms reported having zero subsidiaries. We crosschecked this information to public filings of a sample of Canadian and U.S. firms and determined that several of these firms had subsidiaries. Because accurate identification of domestic and multinational firms is central to our study, we discarded the subsidiary information of the 28,427 parent firms that reported having zero subs. We then code any firm that reports at least one foreign sub as multinational and those that report zero foreign subs as domestic.

Foreign subsidiaries buried beneath ten layers of domestic subsidiaries will be miscoded, but we doubt that this data limitation will have a substantial impact on the paper's inferences.<sup>17</sup>

The Osiris subsidiary measure has a serious flaw. Osiris only reports the subsidiary information as of the most recent updating of the information. Thus, if a company had no subsidiary in Canada before 2007 (the most recent year in the database) and then incorporated a subsidiary in Canada in 2007, we would erroneously treat the company as having had a Canadian subsidiary for all years in our sample. Likewise, if a company had a subsidiary in Canada for all years before 2007 and then liquidated the Canadian subsidiary in 2006, we would erroneously treat the company as not having had a subsidiary in Canada for every year in our sample.

We are unable to assess the extent to which this data limitation may affect the conclusions drawn from this study. However, to mitigate the potential for miscoding the existence and location of foreign subsidiaries, we limit the primary tests in this paper to firm-years since 2002.<sup>18</sup> Our logic is that the foreign subsidiary coding is correct for 2007, has fewer errors in 2006 than in 2005, and has fewer errors in 2005 than in 2004, and so forth. We arbitrarily select the last five years for which we have data as the cut-off for our primary tests in the hope that the miscoding is of an acceptable level for these most recent years. In subsequent tests, we present estimated coefficients from one regression that uses all of the firm-years and from annual regressions for each year. Conclusions are remarkably similar regardless of the sample period.

Our sample selection process yields a main sample of 27,136 firm-years spanning 85 countries, ranging from only one firm-year in seven countries to 7,177 in the U.S. We combine the countries with the fewest observations based on geography and other characteristics, leaving nine large countries: Australia (4% of the sample), Canada (3%), China (3%), France (1%), Germany (1%), India (2%), Japan

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<sup>17</sup> We obtain subsidiary information up to level 10 for parents in all domiciles except Canada, New York, and North Carolina. For unresolved reasons, we were only able to obtain level 1 subsidiary information for firms domiciled in these jurisdictions.

<sup>18</sup> Another advantage of limiting the analysis to recent years is that it mitigates potential survivorship bias. The Osiris database is limited to companies presently in existence. Thus, our analysis is limited to firms that have survived throughout the investigation period. By restricting the sample to firm-years since 2002, we reduce the deleterious effects of survivorship bias.

(24%), UK (8%) and U.S.(26%);<sup>19</sup> four Asian Tigers (Hong Kong, Singapore, South Korea, and Taiwan—12% of the sample), who share a common geography and history of economic development; and 17 Tax Havens (3% of the sample).<sup>20</sup> The remaining 57 countries are organized geographically into five groups: Africa (1% of the sample), Asia (2%), Europe (6%), the Middle East (2%) and Latin America (2%).<sup>21</sup> All of the tests are conducted and results are reported using these 16 countries and groups.

For the 16 countries and groups, Table 1 reports the firm-year means of Sales, Assets, Equity, Total Income Tax Expense, and NIBT, dichotomized into 12,778 domestic-only firms and 14,358 multinationals.<sup>22</sup> Not surprisingly, multinational firms average more sales, assets, equity, total tax expense and NIBT than domestics do. Table 1 also presents the means of the total income tax expense divided by net income before taxes. These are the actual AETRs from the firms' financial statements, not AETRs estimated from regression analysis. The domestics have slightly higher AETRs of 30% compared with 28% for the multinationals. The penultimate column in the table shows the average number of subsidiaries (domestic and foreign) and the last column shows the average number of subsidiaries located in foreign countries.

#### **4. Results from Comparing Domestic-only Firms with Multinationals**

##### *4.1. Actual vs. Estimated AETRs*

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<sup>19</sup> The large countries were selected based on the size of their economy and the number of their firm-years. These nine countries were the only ones with gross domestic product in excess of one trillion dollars in 2008 (per the *CIA World Factbook*) and at least 200 firm-years in the sample.

<sup>20</sup> To identify tax havens, we use the list produced by the Global Policy Forum (see <http://www.globalpolicy.org/nations/laundry/haven/2008/0304listhavens.htm>). Note that though they classify Hong Kong and Singapore as tax havens, we do not include them in the tax haven group but rather as members of the Asian Tiger group. However, inferences are unaltered if we include Hong Kong and Singapore in the Tax Havens group and leave South Korea and Taiwan as the countries in the Asian Tiger group.

<sup>21</sup> We should emphasize that no countries are included twice in the groupings. For example, the Asia group only includes Asian countries not included in other places. Thus, it does not include Japan because it is reported separately.

<sup>22</sup> Osiris asserts that its data are recorded in local currency and provides a variable indicating an appropriate exchange rate for conversion to U.S. dollars and a variable indicating the units in which the data are expressed. However, some unusually large numbers for a few countries, particularly Italy and Mexico, suggest that at least some of the figures are stated in a currency different from the one indicated or in units different from the ones indicated. Since our regression measures are scaled, we doubt that any variation in currency should affect our conclusions. Consistent with that expectation, inferences are unaltered when all Italian and Mexican observations are deleted from the study.

Table 2, Panel A presents the domestic-only AETRs, which are the *COUNTRY* coefficients from estimating equation (1). Panel B presents the multinational AETRs, which are the sum of the *COUNTRY* and the *COUNTRY\*MN* coefficients. All AETRs are expressed in percentages.

The first column in Table 2 reports the actual AETRs from the financial statements. The second column reports the AETRs from estimating equation (1).<sup>23</sup> There is remarkably little difference between the two columns.<sup>24</sup> We infer from the similarity between the actual and estimated AETRs that the control variables (for industry, year and size) have little impact on the coefficients of interest. This pattern holds throughout the paper, suggesting that the inferences drawn in this study would be the same whether we used the actual AETRs from the financial statements or the AETRs estimated in the regression. For brevity, we will focus exclusively on the estimated AETRs in the remainder of the paper.

#### *4.2. Comparing the tax burdens of domestic-only firms across countries*

The AETRs in Table 2, Panel A enable us to compare the tax burdens of domestic-only firms across countries. The estimated regression coefficients for the domestic-only AETRs (in the second column) range from 10% (Middle East) to 39% (Japan) with mean (median) [standard deviation] of 24% (24%) [6%]. The Tax Havens (17%) are the only other group with a domestic AETR under 20%. Japan (39%) is the only country with a domestic AETR above 27%. Throughout the study this pattern will reappear—the Middle East and usually the Tax Havens will have the lowest AETRs, and Japan's AETR will far exceed any other country's AETR.

The domestic AETR for the U.S. is 26%, slightly above the worldwide average and nearly identical to the AETRs of UK, France, Germany and the remaining European countries, which are

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<sup>23</sup> To illustrate, for Canadian companies, Panel A shows that the mean actual AETR from the financial statements for domestic-only firms is 22%, while the estimated AETR for domestics is 23%. Panel B shows that the multinational actual AETR from the financial statement is 26% and the estimated multinational AETR is 24%.

<sup>24</sup> The actual domestic AETRs in Panel A average only 0.4 percentage points more than the domestic estimated AETRs. The largest spread in absolute value is 3.1 percentage points for Japan. More importantly, for purposes of comparing countries, the rank order of the two AETRs columns is nearly identical with a Pearson coefficient of 99%. With the multinationals in Panel B, the actual AETRs average 2.1 percentage points more than the estimated multinational AETRs. The largest spread in absolute value is 3.9 percentage points for Africa. The Pearson correlation coefficient is 99%.

grouped together. This order will hold throughout the study, i.e., the U.S. domestic AETR will be above average and quite similar to those in Europe. Furthermore, ignoring Japan's high rates, the Asian AETRs will be less than the American and European AETRs. In fact, all of the domestic AETRs for France, Germany, UK, U.S., and Europe exceed those for China, India, the Tigers, and Asia and will for most of the tests in the paper.

#### *4.3. Comparing the tax burdens of multinationals across countries*

The AETRs in Table 2, Panel B enable us to compare the tax burdens of multinationals across countries. The mean and median [standard deviation] of the multinational AETRs in the second column are 22% [6%]. As with the domestic AETRs, the Middle East (11%) and Japan (36%) have the extreme AETRs. The Tax Havens (15%), China (17%), Tigers (17%), and India (18%) also are under 20%. Germany (30%) has the second highest multinational AETR. The U.S. multinational AETR follows at 27%. Once again, the U.S. finds itself with an above-average AETR and bracketed by its European trading partners with the next highest AETRs coming from the UK (26%), France (25%) and Europe (24%). The Asian countries, other than Japan, generally have lower AETRs than the Americans and Europeans do. In fact, as with the domestic AETRs, all of the multinational AETRs for France, Germany, UK, U.S., and Europe exceed those for China, India, the Tigers, and Asia. We infer that the general rankings from high-tax countries to low-tax countries are qualitatively the same for domestics and multinationals.

The difference between the percentages in Panel B and those in Panel A (which is the coefficient on *COUNTRY\*MN*) is the amount by which the multinational AETRs exceed the domestic AETRs. The mean (median) [standard deviation] for the difference is -1% (-2%) [2%]. This indicates that the multinationals in most countries face slightly lower AETRs than their domestic-only counterparts face.

Interestingly, the four groups whose domestics face the highest AETRs compared with their multinational counterparts are Asian (India (-5%), China (-4%), Tigers (-3%) and Japan (-3%)). We detect no other patterns. Germany has the largest positive incremental multinational AETR (3%), but the

other European groups are scattered throughout the ranks. The incremental multinational AETR for the U.S. is 1%, consistent with American domestics facing slightly lower AETRs than American multinationals.

#### *4.4. Comparisons using Firms with Negative NIBT and Zero Actual AETRs*

The sample used in the estimations discussed in the previous sections excluded all firm-years with losses (i.e., negative NIBT). In this sensitivity test, we add back the 3,297 firm-years with losses and actual AETRs (from the financial statements) that equal zero and estimate equation (1). By definition, adding these loss firm-years lowers the estimated AETRs.

Nonetheless, the third column in Table 2 shows that the inclusion of loss firm-years has inconsequential impact on the relative high-tax to low-tax rank across the countries: Japanese domestic (multinational) AETRs remain the highest by far at 31% (26%), ten (five) percentage points above the German AETRs. The domestic (multinational) Middle Eastern AETRs are the lowest at 5% (4%), five (three) percentage points below the Tax Havens. All of the multinational AETRs for France, Germany, UK, U.S., and Europe exceed those for China, India, and the Tigers. Thus, we infer that the inclusion of firms with losses and zero actual AETRs has little impact on the inferences about the relative order of high-tax to low-tax countries.

Conversely, the domestic AETRs for the U.S (13%) and UK (15%) are below the domestic mean and median of 16%. This is the only specification (domestic or multinational) in this paper where the American and British AETRs are below the mean and median AETRs. This changes the order of domestic AETRs, leaving American and European AETRs roughly the same as their Asian counterparts.

This reordering of the domestic AETRs is consistent with a disproportionate number of domestic firm-years with losses in Western countries. Indeed, we find that 57% of the domestic additions to the sample as a result of allowing negative NIBT firm-years are American. China, the Tigers, and Asia combined account for only 4% of the sample increase. No Japanese domestics or multinationals and no

Indian domestics are added to the sample. We have no explanation for the absence of Japanese firms or Indian domestics with negative NIBT and zero AETRs.

#### *4.5. Comparisons excluding firms with non-positive AETRs*

The original sample included firm-years with zero AETRs as long as their NIBT was positive. In this robustness check, we drop those 1,058 firm-years with non-positive AETRs as reported in the financial statements. By definition, eliminating these zero AETR firms increases the estimated AETRs. However, the fourth column in Table 2 shows that this change in the sample does not qualitatively affect the relative high-tax to low-tax rank across the countries: Japanese domestic (multinational) AETRs are 40% (36%), nine (six) percentage points above those for the U.S. (Germany), the country with next highest AETR. The domestic (multinational) Middle Eastern AETRs are the lowest at 12% (13%), eight (four) percentage points ahead of the Tax Havens. Once again, the U.S. and European countries generally have higher AETRs than Asian countries. All of the domestic and multinational AETRs for France, Germany, UK, U.S., and Europe exceed those for China, India, the Tigers, and Asia. We conclude that the exclusion of zero AETRs does not affect the relative order of country AETRs.

#### *4.6. Comparisons using Manufacturers Only*

Manufacturers (two-digit NAICS codes 31, 32, and 33) compose 49% of the sample. To assess whether the AETRs in the manufacturing sector are similar to those in other industries, we estimate equation (1) using only manufacturers. The fifth column in Table 2 shows the resulting AETRs. The rank order of the countries is unchanged: Japanese AETRs remain substantially higher than any of the other countries' AETRs. The U.S. and European countries have higher AETRs than Asian AETRs (once again, ignoring Japan). The Middle Eastern AETRs are lowest. Furthermore, the Pearson correlation coefficient for the domestic (multinational) AETRs when all firm-years are included in the sample and when only manufacturers are included is 86% (98%). In short, when the sample is restricted to the

manufacturing sector, results are qualitatively the same as when the full sample is tested. We infer that the AETRs are not substantially different between manufacturers and other companies.

#### 4.7. Comparisons using the Current Income Tax Expense

The numerator in our computation of AETR, the total income tax expense, is the tax expense on current profits, regardless of whether those taxes were paid in the past, are paid in the current year, or will be paid in the future. The current income tax expense includes only that portion of the total income tax expense related to taxes that will be paid in the current year. Thus, current income tax expense should be a better numerator than total income tax expense for our measure of AETRs.<sup>25</sup>

Unfortunately, Osiris does not collect the current income tax expense. However, Compustat Global does collect it.<sup>26</sup> Thus, to test the sensitivity of our inferences to the use of the total income tax expense, we merge the Osiris and Compustat Global databases to create a matched sample of 9,185 firm-years from 2003-2007 for whom data are available in both databases.<sup>27</sup> We then estimate equation (1) using the matched sample and the current income tax expense. The regression coefficient estimates for *COUNTRY* and *COUNTRY\*MN* will enable us to compare domestic and multinational AETRs across

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<sup>25</sup> See Hanlon (2003) for a detailed discussion of both the total and current income tax expenses and problems associated with using either of them to approximate actual taxes paid.

<sup>26</sup> Unfortunately, Compustat Global has its own problems; in particular, it has no foreign subsidiary information. The only item in the Compustat Global database that indicates any foreign activity is foreign tax expense. Unfortunately, accounting rules vary across countries in the reporting of foreign income tax expense, rendering cross-country comparisons based on foreign tax expense problematic. In addition, no foreign income tax expense will be reported by companies that owe no foreign tax, even if they have extensive foreign activities. Thus, the Compustat Global database is inadequate for this study. To illustrate this point, 678 (30%) of the 2,276 firm-years in our matched sample in 2006 (the year in which we have the most confidence in our procedure for identifying multinationals using Osiris data) are classified differently (and we believe erroneously) when we rely on the presence of foreign income tax expense in Compustat Global to identify multinationals.

<sup>27</sup> The matched sample is smaller for several reasons. First, Compustat Global may track different companies from those tracked by Osiris. Second, the only firm identifier common to the two databases is the firm name. Slight variations in the name (e.g., Inc. versus Incorporated) may result in matches being overlooked. Last, an inordinate number of European firms erroneously show zero current tax expense in 2005 and 2006. Compustat Global has acknowledged this error but has not yet corrected it. We drop all firm-years from the problematic countries from our sample.

countries and within countries and thus assess whether the inferences, reached using the total income tax expense, hold when we use the current income tax expense.<sup>28</sup>

The sixth column in Table 2 shows the estimated AETRs using the current income tax expense and the matched sample. A limitation of the smaller, matched sample is that we have fewer observations for some countries, e.g., we have only one domestic African firm-year that reports a current income tax expense. Thus, we do not report an estimated domestic AETR for Africa or any other domestic or multinational cell with fewer than 20 observations. This eliminates domestic and multinational estimated AETRs for Canada and domestic estimated AETRs for France, India, the Tax Havens, Africa and the Middle East, leaving nine (15) domestic (multinational) AETRs.

We find that domestic (multinational) AETRs are 1.2 (0.5) percentage points smaller using current income tax expense than using total income tax expense, which is consistent with deferred tax liabilities exceeding deferred tax assets. We also find that our high-tax to low-tax rankings are largely indifferent to whether the AETR numerator is total or current income tax expense. Japan's current domestic (multinational) AETR remains substantially higher than any other country's AETR at 38% (35%). The next highest AETR is in Europe (Germany) at 32% (30%). With no estimate for the Middle East, the Tigers, and Latin American share the lowest domestic AETR at 17%. The Middle East and China tie for the lowest multinational AETR (14%). Ignoring Japan, all of the Asian AETRs are less than the American and European AETRs.

In summary, the AETRs and the relative rank of the countries are largely unaffected by whether the numerator in the AETR calculation is total income tax expense or current income tax expense. Thus, for the remainder of this paper, we will use the sample with total income tax expense as the numerator because it is triple the size of the sample that uses the current income tax expense.

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<sup>28</sup> To establish comparability between the two samples, we first estimate equation (1) with the smaller, matched sample, but continuing to use the total income tax expense in the numerator of the AETR measure. We find that the AETRs from this regression are similar to the ones estimated using the full sample and total income tax expense. This provides confidence that any difference between the findings using total income tax expense in the numerator and those using current income tax expense in the numerator is not attributed to sample differences.

#### *4.8. Comparisons using all Firm-Years from 1988-2007*

As discussed above, we exclude pre-2003 firm-years because the Osiris foreign subsidiary information, which we use to identify multinationals, is only coded for the most recent Osiris update. Since we do not know when a firm formed its first foreign subsidiary and certainly many companies became multinationals since our data begin in 1988, using all firm-years undoubtedly results in miscoding some domestic-only firm-years as multinational firm-years.

To find out if this miscoding for some unknown number of firm-years before 2003 affects the high-tax to low-tax ranking among the countries in our study, we estimate equation (1) including all firm-years for which we have data. This adds 41,737 firm-years to our sample. The last column in Table 2 shows the resulting estimated AETRs.

Despite this 150% increase in observations and the inevitable miscoding of multinationals introduced by adding the earlier firm-years and the potential survivorship bias noted above, the inferences are remarkably unaltered. As evidence, the Pearson correlation coefficient for the domestic-only (multinational) AETRs from the original, post-2002 sample and this larger sample with all firm-years is 92% (96%).

The rank order of the countries remains qualitatively unaltered: the Japanese domestic (multinational) AETR is 38% (36%), nine (five) percentage points greater than those for France (Germany), the country with next highest AETR. The domestic (multinational) Middle Eastern AETR is the lowest at 11% (12%), seven (two) percentage points below those of China and Latin America (Tax Havens). Once again, the U.S. and European countries generally have higher AETRs than Asian countries. All of the domestic and multinational AETRs for France, Germany, UK, U.S., and Europe exceed those for China, India, the Tigers, and Asia. In short, the high-tax to low-tax rankings are substantially the same from 1988 to 2007 as they are for the years 2003-2007.

#### *4.9. Year-by-year comparisons from 1988 to 2007*

The previous section establishes that the estimates of equation (1) are substantially the same whether the sample is drawn from recent years (2003-2007) or from the entire investigation period (1988-2007). In this section we report annual estimated AETRs, using the complete sample of firm-years to estimate equation (1). These estimated regression coefficients enable us to analyze the changes in AETRs over time for each country.

Table 3 reports the annual estimated domestic and multinational AETRs. Percentages are only presented if there are at least 20 observations, but all available firm-years were included in the regressions.

We find that the high-tax to low-tax rank across countries has changed little over the two decades. The order in 1988 (the first year) was similar to the rank in 2006 (the final year with data for all groups). In 1988, the Japanese multinational AETR was the highest at 49% (15 percentage points ahead of any other country); in 2006, they were the highest at 36% (nine percentage points higher than those from any other country). In fact, although their rates declined significantly over time, in every year Japanese domestic and multinational AETRs were higher than those in any country (note that we have no Japanese domestic AETR information before 1993). Further work is needed to understand Japan's ability to sustain substantially higher tax rates than its trading partners throughout the two decades.

In 1988, the Tax Havens enjoyed the lowest multinational AETR. Since then, they have averaged just three percentage points above the minimum AETR for all groups. The Middle East has had the lowest domestic (multinational) AETRs since 2000 (2002). From 1997 to 2000, no multinationals had lower AETRs than India.

The U.S. and European countries always had higher AETRs than the Asian countries, with the notable exception of Japan. In 1998 (the first year with data for all Asian countries), the AETRs of France, Germany, UK, U.S., and Europe averaged 29%. The AETRs of China, India, Tigers, and Asia averaged 15%. In 2006, those same Western countries bested their same Eastern counterparts 25% to 18%.

Moreover, the American and European countries have consistently bunched together with two notable differences. One, the European multinational AETR was 22% in 1989, even lower than the Tax Haven's multinational AETR. European AETRs remained steady over time and were slightly above average by 1999. Every other group had lower AETRs in 2006 than they did in 1988.

Second, German multinational AETRs approached Japanese levels in 1989 at 47%. Over the next two decades, German multinational AETRs fall more than any other country's, ending 2006 at 27%, although still five percentage points above average. Two other countries with large declines were Japanese multinationals from 49% in 1988 to 36% in 2006 and Australian multinationals from 34% in 1988 to 22% in 2006. U.S. AETR declines were more modest: multinational and domestic AETRs both dropped by only two percentage points. For the ten groups for which we have data from 1989 to 2006 (British and American domestics and multinationals and Australian, French, German, Japanese, Tax Haven and European multinationals), the average decline over the period was 6 percentage points or 18% of their 1989 AETRs.

The AETR declines had one precipitous drop. Nearly half of the decline in percentage points occurred between 1992 and 1994. During those two years, German multinational AETRs fell 14 percentage points. Australian multinational AETRs tumbled 8 percentage points. Japanese and Tax Haven multinational AETRs dropped 6 percentage points. The decrease was permanent. AETRs for those four groups never rebounded.

Two other countries are worth mentioning. From 2002 to 2003, the AETRs for Canadian domestics dropped from 31% to 22% and multinationals from 27% to 21%. Neither group has seen its AETR jump back to its earlier level. Finally, the only country that showed a substantial increase in AETRs is India, where multinational AETRs jumped from 8% in 2000 to 20% in 2002 and have remained at roughly that level.

## **5. Results from Comparing Foreign Subsidiaries**

### *5.1. Cross-country comparisons*

In the previous section, we used the presence of a foreign subsidiary to distinguish multinationals from domestic-only firms. In this section, we include categorical variables for the locations of the foreign subsidiaries in the regression model. The coefficients on the foreign subsidiary variables enable us to assess the extent to which (a) the tax burdens of subsidiaries vary across countries, (b) the location of a parent affects the tax burdens of its foreign subsidiaries, and (c) the location of a foreign subsidiary affects the tax burdens of its parent. The regression equation is:

$$AETR_{it} = \sum \beta_{0_j} COUNTRY_{it}^j + \sum \beta_{1_k} SUB_{it}^k + \sum \beta_{2_m} INDUSTRY_{it}^m + \sum \beta_{3_n} YEAR_{it}^n + \sum \beta_{4_p} SIZE_{it}^p + \varepsilon_{it} \quad (2)$$

where:  $SUB_{it}^k$  = an indicator variable equal to 1 if firm  $i$  reports a subsidiary in country  $k$ , equal to 0 otherwise.

All other variables are defined the same as in equation (1). The estimated regression coefficient on  $SUB$  is the estimated AETR for a foreign subsidiary's home country.

We continue to use the same 16 groups as in the previous section. Each group serves as a  $COUNTRY$  variable and a  $SUB$  variable. Each firm-year has one country in which its  $COUNTRY$  variable is coded one. However, it has  $n$   $SUBs$  coded one, where  $n$  is the number of different countries in which the parent has at least one subsidiary.<sup>29</sup>

We begin with the original sample of 27,136 firm-years since 2002 with total income tax expense as the numerator for the AETR. We lose 167 firm-years whose companies indicated that they had a foreign subsidiary, which was adequate for coding it as a multinational in estimating equation (1), but did not specify the location of the foreign subsidiary, rendering it unusable for estimating equation (2). The remaining 26,969 firm-years have  $SUB$  coded as one 57,887 times. All 16 subsidiary locations have at least 1,500 firm-years. Europe is the most popular location for foreign subsidiaries with 6,653 firm-years.

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<sup>29</sup> For example, if a U.S. parent had subsidiaries in Canada, Germany, and Bermuda,  $COUNTRY^{US}$ ,  $SUB^{CANADA}$ ,  $SUB^{GERMANY}$ , and  $SUB^{BERMUDA}$  would each be coded one and all other  $COUNTRY$  and  $SUB$  variables would be coded zero.

Table 4 shows the regression coefficient estimates for *COUNTRY* in Panel A and *SUB* in Panel B. The *COUNTRY* coefficients from equation (2) should be the same as the *COUNTRY* coefficients from equation (1), except to the extent that identifying the location of a firm's foreign subsidiaries, as opposed to just identifying the existence of a foreign subsidiary, provides information. It seems plausible that knowing the subsidiary's home country would affect inferences because foreign subsidiaries are not randomly distributed across parents (e.g., Canadian companies are more likely to have a subsidiary in the U.S. than are Indian companies). In addition, multinationals from some countries might be more likely to have profitable foreign investments or operate in high-tax countries. That said, we find little evidence that the location of the foreign subsidiary matters. Only two *COUNTRY* coefficients are more than one percentage point different from the corresponding *COUNTRY* coefficients in Table 2. The domestic German AETR increases from 27% to 30%, while the domestic Indian AETR drops from 23% to 20%.

We now turn our attention to Panel B and the *SUB* coefficients. We expect cross-country variation in the *SUB* coefficients to the extent that locating a foreign subsidiary in a country affects the multinational's worldwide tax expense. For example, if a firm can report more of its profits in a tax haven than in a high-tax country, then its total tax burden should be lower. We find no evidence of substantial cross-country variation in *SUB* coefficients. The *SUB* coefficients range from a 1.3 percentage points decrease in AETRs (Asia) to a 1.1 percentage points increase in AETRs (Australia). The Tax Haven *SUB* coefficient implies that a firm with at least one subsidiary in a haven country enjoys a 0.6 percentage point lower AETR, negative but hardly a substantial amount. Similarly, the Tiger countries, which include two countries that are commonly considered tax havens (Hong Kong and Singapore), has a *SUB* coefficient of -0.5, which is negative but also largely inconsequential.

In untabulated tests, we repeat the analysis using current income tax expense and the sample described in Section 4.7. Inferences are unaltered. We infer from these tests that any cross-country variation in tax expenses experienced by foreign subsidiaries has little impact on the consolidated parent's income tax expense. This is consistent with our earlier results which showed that domestics and multinationals within a country face roughly the same tax rates. This conclusion holds even after we

replace a crude measure, the mere presence of a foreign subsidiary, with a finer measure, the location of the subsidiary.

That said, our tests may suffer from inadequate power arising from data limitations. Recall that Osiris only provides foreign subsidiary information for the most recent year. Thus, there is no intertemporal variation in the subsidiary mixes of the firms in our sample. Furthermore, clustering among subsidiaries may undermine our ability to interpret the coefficients. For example, if firms that operate in high-tax countries always have subsidiaries in tax havens, then our estimated regression coefficients for high-tax countries may be capturing the lower taxes provided by tax havens and vice versa. That said, we find evidence in the next section that is consistent with parent and subsidiary locations affecting AETRs. Therefore, any possible data and design weaknesses perceived in these tests do not seem to be overwhelming.

### *5.2. Parent-subsidiary interactions*

The lack of results in the previous section may stem from the fact that foreign subsidiaries affect the AETRs of their parents differently depending on the location of the parent. For example, German subsidiaries may lower the high-tax AETRs of Japan parents but increase the low-tax AETRs of Tax Havens parents. In the prior tests, the two effects of German subsidiaries may have offset each other, giving the appearance that German subsidiaries have little impact on their parents' AETRs.

In this section, we alter the research design in an attempt to detect any possible parent-subsidiary interactive effects. Specifically, we modify equation (2) by adding interactions between the *COUNTRY* and *SUB* variables. We then compare the coefficients on the interactions to assess the extent to which subsidiaries affect parents differently, depending on whether the parent is in a high-tax or low-tax country.

Table 5 presents the interaction coefficients (recall that no coefficients are shown unless there are at least 20 observations in a cell).<sup>30</sup> Consistent with foreign subsidiaries in tax havens reducing multinationals' overall tax burdens, we find that all, but one group (Asia), reduce their AETRs when they have a subsidiary in the Tax Haven countries. The largest tax savings are enjoyed by Latin American parents, who reduce their AETR by 6.9 percentage points, and Tiger parents, who reduce their AETRs by 5 percentage points. However, we find that Asian and Middle Eastern subsidiaries provide even greater savings to their parents. Every parent country reduces its AETR when it has a subsidiary in those two locations.

On the other hand, subsidiaries in the U.S. increase their parents' AETRs. All parents, except France, show an increase in their worldwide tax expense, led by Latin American parents (9.5%) and African parents (8.2%). Foreign subsidiaries in Japan (Tigers) [Africa] also increase all parents' worldwide tax expenses with the largest increase incurred by German (Australian) [Japanese] parents.

Note that there are at least two reasons why foreign subsidiaries in these countries (U.S., Japan, Tigers and Africa) would increase the tax expenses of their multinational parents. First, they may tax foreign subsidiaries more heavily than other countries tax the rest of their worldwide enterprise. Second, those foreign subsidiaries may be more profitable than the rest of the worldwide enterprise. Unfortunately, our tests are unable to adjudicate between these two possibilities.

This interactive specification also allows us to determine whether parents in a country face different tax burdens depending on the location of their foreign subsidiaries. For example, we can compare the coefficient on the interaction of U.S. parents with Japanese subsidiaries with the coefficient on the interaction of U.S. parents with Tax Haven subsidiaries to measure the benefits to U.S. parents of having a subsidiary in a tax haven as opposed to having one in Japan.

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<sup>30</sup> Since we have groups of countries, the group can have its foreign subsidiaries in its group. For example, an Italian company may have a subsidiary in Spain. Since both countries are in the European group, the observation will appear in the cell that shows Europe as both parent and subsidiary.

In contrast to the clear patterns that we find among the subsidiaries (i.e., some are always tax increasing and others always tax decreasing), we find few patterns among parents. No parent countries always face tax increases (or decreases) regardless of the subsidiary location.

As would be expected, we find evidence that Tax Haven parents increase their worldwide AETRs when they invest in other countries. Substantial tax increases occur with subsidiaries in Australia (6.6 percentage points), the U.S. (5.7 percentage points), Japan (4.9 percentage points) and Germany (4.6 percentage points). The only substantial tax savings occur with foreign subsidiaries in places with low taxes, namely the Middle East (4.8 percentage points) and other Tax Haven countries (3.1 percentage points).

U.S. parents face the highest AETR increase from their foreign subsidiaries in Tiger (5.4 percentage points) and African (4.1 percentage points) countries. They enjoy the greatest tax reductions in the Middle East (5.1 percentage points) and Asia (4.3 percentage points).

We also find that Tax Haven subsidiaries lower U.S. AETRs by 1.6 percentage points. This estimate is remarkably similar to the finding in Dyreng and Lindsey (2009) that U.S. firms with at least one subsidiary in a tax haven have a tax burden on worldwide income that is 1.5 percentage points lower than that of U.S. firms with no subsidiaries in tax haven countries.

To summarize, our interactive tests detect some patterns among parent-subsidiary AETRs. We find that foreign subsidiaries in Tax Havens, Asia and the Middle East result in AETR reductions for multinationals. Conversely, we find that foreign subsidiaries in the U.S., Japan, Tiger countries and Africa uniformly increase the tax expense of their multinational parents. We also find that the AETRs of Tax Haven parents rise unless they establish foreign subsidiaries in equally low-tax countries.

## **6. Closing Remarks**

To our knowledge, this paper provides the most comprehensive analysis of international firm-level corporate income tax burdens to date. Its findings should aid the development of tax policy by quantifying the average effective tax rates faced by multinational corporations around the globe. The

AETRs provide an empirical foundation for the heated debates about the taxes paid by multinationals and domestics around the world and should help to balance rhetoric with documented empirical facts.

Examining firm-level financial statement information for 10,642 corporations domiciled in 85 different countries with subsidiaries in 195 different countries, we compute country-level AETRs for 68,873 firm-years from 1988 to 2007. We estimate country-level AETRs by regressing firm-level AETRs on categorical variables for the firm's home country, the presence (and, in some tests the location) of a foreign subsidiary, and variables intended to control for systematic effects over time, across industries, and related to firm size. The regression coefficients for the categorical variables provide estimates of country-level tax burdens.

We find that:

- Multinationals and domestic-only firms face similar AETRs;
- Japan consistently has much higher AETRs than any other country;
- The U.S. and European countries have above-average AETRs;
- Tax havens, and Middle Eastern, and Asian countries (excepting Japan) have below-average AETRs.
- AETRs fell worldwide over the last two decades;
- The decline in AETRs was about six percentage points or 18%, primarily from 1992 to 1994.
- German, Japanese, Australian and Canadian AETRs fell more than American, British, and French AETRs.
- The ordinal rank from high-tax countries to low-tax countries remained remarkably constant because all countries reduced their tax burdens.

On this last point, further work is warranted to understand how the tax order of countries has remained so steady over two decades of radical worldwide changes in business, law, politics and technology, to name a few. Although tax rates have fallen dramatically over the last 20 years, high-tax

countries remain high-tax and low-tax countries remain low-tax. Perhaps globalization permits countries to change their tax systems but forces a herding effect because tax changes in one country reverberate around the globe. If this is the case, then fundamental tax changes, e.g., adopting a formula apportionment system or conforming book and tax accounting, may be impossible without worldwide coordination.

We should note that while high AETRs may indicate that a country taxes its corporations heavily, it is possible that the countries have high AETRs because they are more prosperous, attract better managers and/or create better business opportunities. Our tests are unable to distinguish between these two competing explanations, but we would welcome research that could differentiate between them.

Finally, we close by reminding the reader of an important caveat discussed above, namely that the AETRs computed in this study do not use actual tax return data. Instead, we resort to the only publicly available firm-level tax information: income tax expense and profit measures disclosed in companies' financial statements. To the extent our measures suffer from differences in the role of accounting information and the rules governing financial reporting, our tests may be flawed. However, based on prior work that documents a close link between the tax information in the financial statements and tax information in the tax return, we trust that our estimates are not so imprecise as to lead to erroneous inferences.

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**Table 1**  
Sample

		n	Sales	Assets	Equity	Total tax	NIBT	ATR (%)	# Subs	# Foreign subs
Full sample	Domestic	12,778	612	847	305	17	56	30	13	
	Multinational	14,358	3,513	4,290	1,563	115	371	28	68	30
AUSTRALIA	Domestic	474	133	316	133	8	28	24	13	
	Multinational	664	1,055	1,298	600	36	158	24	53	22
CANADA	Domestic	376	423	547	274	11	52	22	7	
	Multinational	426	1,340	2,616	963	67	218	26	31	11
CHINA	Domestic	534	176	289	112	3	14	21	11	
	Multinational	184	762	1,132	392	17	96	18	20	6
FRANCE	Domestic	44	62	290	157	3	32	25	14	
	Multinational	333	8,340	10,275	3,204	276	815	28	241	119
GERMANY	Domestic	74	79	199	72	3	11	26	71	
	Multinational	293	8,757	12,990	3,270	200	628	33	151	71
INDIA	Domestic	80	193	243	80	4	15	24	2	
	Multinational	375	508	637	303	15	78	20	6	5
JAPAN	Domestic	3,929	642	715	262	14	35	42	7	
	Multinational	2,497	3,875	4,534	1,642	96	252	39	42	13
UNITED KINGDOM	Domestic	749	419	730	279	16	61	26	41	
	Multinational	1,314	3,340	3,580	1,295	135	426	28	99	25
UNITED STATES	Domestic	2,836	1,166	1,799	582	36	111	28	25	
	Multinational	4,341	4,965	6,136	2,333	185	597	30	81	38
TIGERS	Domestic	2,241	330	414	177	7	33	20	4	
	Multinational	972	2,236	2,411	918	34	190	18	19	7
TAX HAVENS	Domestic	48	134	316	151	3	18	17	9	
	Multinational	819	1,765	1,979	881	42	197	17	69	58
AFRICA	Domestic	128	665	753	379	40	128	27	5	
	Multinational	184	1,750	1,405	541	56	200	26	42	19
ASIA	Domestic	452	145	254	119	6	24	22	2	
	Multinational	172	357	666	220	12	45	23	19	6
EUROPE	Domestic	318	265	548	195	14	49	27	19	
	Multinational	1,340	2,577	3,233	1,108	94	297	26	84	44
LATIN AMERICA	Domestic	326	1,020	1,284	509	45	160	26	7	
	Multinational	175	1,840	2,388	936	57	248	25	18	4
MIDDLE EAST	Domestic	169	163	335	168	3	34	8	4	
	Multinational	269	345	717	325	8	56	11	18	12

This table presents the means of variables in the Osiris dataset for years 2003-2007. All dollar figures are in millions of U.S. dollars.

**Table 2**  
Summary of results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2003-2007 Positive NIBT Nonnegative AETR	2003-2007 Positive NIBT Nonnegative AETR	2003-2007 Nonzero NIBT Nonnegative AETR	2003-2007 Positive NIBT Positive AETR	2003-2007 Manufacturing firms Positive NIBT Nonnegative AETR	2003-2007 Positive NIBT Nonnegative AETR AETR= Current tax/NIBT	1988 - 2007 Positive NIBT Nonnegative AETR
AdjR2		0.86	0.82	0.88	0.87	0.88	0.87
N		27,136	30,433	26,078	13,034	9,185	68,873
	Mean	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
<b>Panel A - Domestic</b>							
AUSTRALIA	24	24	11	28	27	21	24
CANADA	22	23	13	26	27		25
CHINA	21	21	15	23	21	20	18
FRANCE	25	26	21	27			29
GERMANY	26	27	21	28		25	27
INDIA	24	23	18	24	21		21
JAPAN	42	39	31	40	38	38	38
UNITED KINGDOM	26	26	15	27	27	24	23
UNITED STATES	28	26	13	31	30	28	24
TIGERS	20	20	13	21	20	17	19
TAX HAVENS	17	17	10	20			19
AFRICA	27	25	18	26	30		21
ASIA	22	22	17	23	20	22	22
EUROPE	27	26	18	28	28	32	25
LATIN AMERICA	26	24	16	25	26	17	18
MIDDLE EAST	8	10	5	12	12		11
<b>Panel B - Multinational</b>							
AUSTRALIA	24	22	10	25	25	22	23
CANADA	26	24	13	26	26		25
CHINA	18	17	10	19	15	14	15
FRANCE	28	25	16	26	26	23	23
GERMANY	33	30	21	32	32	30	32
INDIA	20	18	13	19	22	19	15
JAPAN	39	36	26	38	36	35	37
UNITED KINGDOM	28	26	17	27	27	25	24
UNITED STATES	30	27	15	29	28	27	26
TIGERS	18	17	9	18	17	15	15
TAX HAVENS	17	15	7	17	17	15	14
AFRICA	26	23	14	24	24	23	19
ASIA	23	22	15	22	22	19	20
EUROPE	26	24	15	26	25	24	22
LATIN AMERICA	25	22	13	24	24	23	18
MIDDLE EAST	11	11	4	13	13	14	12

Column (1) reports the mean AETR for each country/group in the Osiris 2003-2007 sample, as shown in Table 1. Columns (2) – (7) present the results of estimating  $AETR_{it} = \sum \beta_{0j} COUNTRY_{it}^j + \sum \beta_{1j} (COUNTRY_{it}^j * MN_{it}) + CONTROLS$  on samples described in the column headings. Panel A reports the estimate of  $\beta_0$  for each country/group. Panel B reports the estimate of  $(\beta_0 + \beta_1)$  for each country/group. All available observations were included in the estimation, but estimates are only reported for countries/groups having 20 or more observations.

**Table 3**  
Yearly estimates

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
AdjR2	0.90	0.90	0.90	0.89	0.89	0.88	0.89	0.89	0.88	0.88	0.88	0.87	0.87	0.87	0.86	0.86	0.85	0.86	0.85	0.86
N	1,175	1,288	1,409	1,493	1,694	1,918	2,359	2,679	2,993	3,255	3,463	4,101	4,536	4,394	4,980	5,734	6,567	6,991	7,085	759
<b>Panel A - Domestic</b>																				
AUSTRALIA													26	26	22	20	21	24	23	23
CANADA											33	32	30	29	31	22	22	20	19	
CHINA											20	17	16	18	21	20	20	21	21	
FRANCE																				
GERMANY																		25	23	
INDIA																		19		
JAPAN						48	43	42	42	44	44	40	42	40	41	38	36	38	39	39
UNITED KINGDOM	30	32	30	28	29	26	26	25	24	24	23	24	24	25	26	25	23	25	26	21
UNITED STATES	28	28	27	26	27	25	25	25	25	26	27	26	26	25	26	24	24	24	25	26
TIGERS						32	26	26	24	21	22	21	21	21	21	18	18	19	18	
TAX HAVENS																				
AFRICA													18	18	24	24	23	25	24	
ASIA							30	30	28	30	25	13	23	26	25	21	22	20	22	
EUROPE										28	29	30	28	25	25	29	25	25	25	
LATIN AMERICA					16	17	14	13	9	13	15	15	21	23	23	25	22	23	24	
MIDDLE EAST													13	11	8	8	11	7	9	
<b>Panel B - Multinational</b>																				
AUSTRALIA	34	33	32	27	34	26	26	25	25	24	27	25	24	25	22	20	21	22	22	20
CANADA					28	31	24	26	29	31	31	32	29	29	27	21	22	22	24	
CHINA											11	15	14	13	18	16	16	17	17	
FRANCE	27	29	26	25	26	22	22	23	23	28	29	28	26	27	26	24	23	23	25	
GERMANY		47	46	42	44	36	30	33	33	34	38	37	34	31	32	32	27	29	27	
INDIA										9	8	10	8	16	20	18	17	17	18	
JAPAN	49	50	47	46	49	45	43	41	41	42	44	39	37	38	38	34	33	33	36	39
UNITED KINGDOM	28	29	28	27	28	24	25	24	25	25	25	24	27	27	29	26	24	25	25	23
UNITED STATES	29	30	30	28	29	27	27	27	28	29	29	29	30	28	27	24	25	25	27	24
TIGERS						22	17	19	17	16	19	17	17	15	16	13	14	15	17	
TAX HAVENS	21	24	20	19	20	14	14	14	15	16	16	17	15	16	16	14	14	13	15	
AFRICA											23	14	20	21	20	19	21	23	22	
ASIA							24	22	22	22	21	14	19	20	23	23	20	21	20	
EUROPE	23	22	25	21	23	19	21	21	23	24	24	24	26	25	25	23	23	22	23	
LATIN AMERICA					18	18	19	14	14	12	13	16	18	18	22	22	19	20	23	
MIDDLE EAST												17	15	15	14	11	9	9	11	

Results of estimating  $AETR_{it} = \sum \beta_{0j} COUNTRY_{it}^j + \sum \beta_{1j} (COUNTRY_{it}^j * MN_{it}) + CONTROLS$  for each year in the sample described in Column (7) of Table 2. Panel A reports the estimate of  $\beta_0$  for each country/group. Panel B reports the estimate of  $(\beta_0 + \beta_1)$  for each country/group. Estimates are reported for country-years with 20 or more observations.

**Table 4**  
Results of Parent/Subsidiary Specification

AdjR2	0.86
N	26,969
<b>Panel A - Parents</b>	
AUSTRALIA	24
CANADA	24
CHINA	20
FRANCE	26
GERMANY	30
INDIA	20
JAPAN	38
UNITED KINGDOM	26
UNITED STATES	27
TIGERS	19
TAX HAVENS	17
AFRICA	24
ASIA	22
EUROPE	25
LATIN AMERICA	24
MIDDLE EAST	11
<b>Panel B - Subsidiaries</b>	
AUSTRALIA	1.1
CANADA	0.6
CHINA	(0.7)
FRANCE	0.8
GERMANY	(0.6)
INDIA	0.4
JAPAN	(0.5)
UNITED KINGDOM	0.0
UNITED STATES	(1.1)
TIGERS	(0.5)
TAX HAVENS	(0.6)
AFRICA	0.9
ASIA	(1.3)
EUROPE	0.4
LATIN AMERICA	(0.4)
MIDDLE EAST	(0.3)

This table presents the results of estimating  $AETR_{it} = \sum \beta_{0j} COUNTRY_{it}^j + \sum \beta_{1k} SUB_{it}^k + CONTROLS$  on a subsample of the sample described in Table 1 for which we have necessary subsidiary information. Panel A reports the estimate of  $\beta_0$  for each country/group. Panel B reports the estimate of  $\beta_1$  for each country/group.

**Table 5**  
Estimates of Parent/Subsidiary Interactions

Parents	Subsidiaries	AUSTRALIA	CANADA	CHINA	FRANCE	GERMANY	INDIA	JAPAN	UNITED KINGDOM	UNITED STATES	TIGERS	TAX HAVENS	AFRICA	ASIA	EUROPE	LATIN AMERICA	MIDDLE EAST
		AUSTRALIA	(1.1)	(1.6)	(1.6)	3.2	(0.3)	4.9	1.3	3.1	7.0	(3.6)	1.8	(4.9)	(0.3)	(0.5)	(1.4)
CANADA				2.9			2.2	7.6		(1.8)			0.4	(0.2)			
CHINA										0.9							
FRANCE	9.1	0.3	2.6		2.4	(1.5)	2.1	(0.8)	(0.9)	2.5	(3.8)	2.3	(10.5)	3.8	2.6	(1.3)	
GERMANY	4.0	(6.4)	2.1	3.4		0.6	7.6	(1.8)	3.3	5.6	(1.2)	4.0	(9.3)	3.2	(3.4)		
INDIA					(1.4)			(0.1)	0.1					1.8			
JAPAN	1.9	(3.5)	0.0	3.4	(1.2)	(0.8)		0.9	4.8	2.8	(0.0)	7.8	(4.1)	(0.7)	(2.4)	(2.5)	
UNITED KINGDOM	6.2	(4.2)	(0.2)	2.4	1.8	2.5	4.1		4.5	3.8	(2.5)	3.7	(3.0)	0.9	(2.4)	(7.4)	
UNITED STATES	4.6	(1.6)	(1.7)	1.3	0.9	(1.1)	1.7	1.7		5.4	(1.6)	4.1	(4.3)	0.9	(0.1)	(5.1)	
TIGERS	8.2	(0.4)	(1.5)	5.3	0.5	2.3	3.1	(1.9)	7.3	1.2	(5.0)		(4.1)	(3.1)	(1.7)	(4.1)	
TAX HAVENS	1.0	(4.7)	(0.3)	6.6	4.6	(0.5)	4.9	0.3	5.7	3.2	(3.1)	4.3	(1.3)	2.0	(0.9)	(4.8)	
AFRICA	(0.2)							(0.5)	8.2		(1.9)	2.9		1.1	(2.0)		
ASIA			(0.1)					(2.2)		5.0	1.6		(6.4)				
EUROPE	5.5	(3.6)	(0.3)	(0.2)	2.1	(3.1)	5.3	1.6	7.5	3.1	(2.8)	1.3	(2.3)	(1.9)	(0.5)	(2.3)	
LATIN AMERICA									9.5		(6.9)				(2.5)		
MIDDLE EAST		3.0			0.6			2.1	7.2		(3.6)			2.3	5.4	(9.9)	

This table presents the results of estimating  $AETR_{it} = \sum \beta_{0j} COUNTRY_{it}^j + \sum \beta_{1k} SUB_{it}^k + \sum \beta_{2n} COUNTRY_{it}^j * SUB_{it}^k + CONTROLS$  on a subsample of the sample described in Table 1 for which we have necessary subsidiary information. Each cell reports the estimate of  $\beta_2$  for the interaction of the given parent and subsidiary variables. For example, the estimate of  $\beta_2$  for the interaction term  $COUNTRY_{it}^{AUSTRALIA} * SUB_{it}^{CANADA}$  is (1.1). All interaction terms were included in the estimation, but estimates are only reported for cells with 20 or more observations.