

# Normal Tax Rate

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## Abstract

Estimates of the “normal” tax rate faced by the firm are required for forecasting, valuation, earnings quality analysis, and other contexts. They can be derived using the reported effective tax rate (ETR), based on the statutory tax rate, by analyzing ETR reconciliation data, or using other disclosures. This study develops an algorithm that combines the first two methods and incorporates additional information to generate a tax rate estimate. It shows that the estimate performs well in predicting ETRs over the intermediate term and in identifying transitory components of reported income taxes.

**JEL Classification:** G12, G17, G31, G32, M41

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**Data availability:** All data are available from sources identified in the text

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## 1. Introduction

Measures of corporate tax rates are needed for various reasons, including (1) forecasting aftertax earnings or cash flows, (2) estimating the aftertax cost of capital, (3) measuring the abnormal portion of the income tax expense, and (4) estimating aftertax financing and transitory items to undo them from reported earnings and measure core operating profit (e.g., Nissim 2022b). These tax rates can be estimated based on the reported effective tax rate (**ETR**), using the statutory tax rate, by analyzing ETR reconciliation data, or using other disclosures (e.g., components of the income tax expense, taxes actually paid, domestic versus foreign earnings and ETRs, components of deferred tax assets and liabilities, and non-GAAP measures and reconciliations). This study develops an algorithm that combines the first two methods and incorporates additional information to generate an estimate of the tax rate faced by the firm (hereafter normal tax rate or **NTR**). The empirical analysis demonstrates that NTR performs well in predicting the effective tax rate over the intermediate term (one to seven years ahead), and that it helps identify the transitory component of reported income taxes. In addition, while tax rates on operating profit and for measuring WACC likely differ from this estimate (as well as from each other), by removing transitory effects NTR provides relevant information for estimating these tax rates as well.

The approach used in this study to estimate the normal tax rate essentially extracts information from the firm-specific relationship between the effective tax rate and the combined statutory tax rate (federal and state) over recent years. It also applies adjustments to the effective tax rate to reduce excess volatility and mitigate some sources of measurement error using information obtained from Compustat. The empirical analysis shows that both parts of the algorithm contribute to the informativeness of the normal tax rate.

The paper proceeds as follows. Section 2 describes alternative methods for estimating firm-specific tax rates and their relative advantages and disadvantages. Section 3 develops the methodology for estimating NTR. Section 4 empirically evaluates the efficiency of NTR in (1) removing transitory tax effects from ETR, and (2) predicting future ETRs. Section 5 concludes.

## **2. Income tax rates**

This section discusses advantages and disadvantages of predicting future tax rates using the effective tax rate (ETR; subsection 2.1), the statutory tax rate (2.2), ETR reconciliations (2.3), and other disclosures (2.4).

### ***2.1 Effective tax rate***

The effective tax rate (ETR) is the ratio of the income tax expense to pretax income, where the income tax expense generally measures the current, past, and future tax consequences of currently reported pretax income.<sup>1</sup> That is, ETR measures the tax rate that will ultimately be levied against reported pretax income, independent of the timing of the tax payments. Thus, at the theoretical level, ETR should reflect the “true” tax rate better than cash-based measures (e.g., ETR based on the current portion of the income tax expense or on income taxes paid during the period), the same way that earnings provide a more complete measure of profitability compared to operating cash flow.

However, empirically the effective tax rate is often very volatile, making it a poor proxy for future tax rates. This is due to several reasons. First, the income tax expense may include

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<sup>1</sup> The income tax expense is calculated as the sum of two components: current portion and deferred portion (see Section 5.8 in Nissim 2022a). The current portion reflects the amount of income taxes owed for the current period, which is based on taxable income, while the deferred portion essentially adjusts for the tax implications of the difference between pretax (book) income and taxable income. Thus, the deferred portion includes the past and future tax consequences of currently reported pretax income.

transitory or highly volatile components such as the impact of changes in tax reserves (called “unrecognized tax benefits” in the U.S.), unreserved prior periods tax payments, changes in the tax valuation allowance (U.S.) or in unrecognized deferred tax assets (IFRS), the cumulative impact of changes in tax rates or tax laws, and stock based compensation excess tax benefits.<sup>2</sup> Second, pretax income may include nontaxable transitory components such as goodwill impairment, fines, and some insurance proceeds. Such items change pretax income without changing the income tax expense, thus triggering a transitory ETR shock. Third, when different sources of income are subject to different tax rates (e.g., by jurisdiction or nature of income), variation in income mix results in transitory changes in the effective tax rate. In other words, volatility in income mix leads to volatility in ETRs.

One approach to mitigate the effects of transitory components is to average the effective tax rate over several recent years. However, some of the time series variation in ETR may relate to changes in statutory tax rates, trends in income mix, or other effects that may persist in the future. In effect, this study develops a method that extracts information from past and current ETRs while controlling for such changes and trends.

Academics use variants of the effective tax rate in studying tax avoidance, the tax benefits of debt, tax effects on investment and payout, earnings quality, and equity valuation (see Hanlon and Heitzman 2010 and Graham et al. 2012 for reviews of the literature).<sup>3</sup> Practitioners use the

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<sup>2</sup> This is not a complete list. There may be additional transitory tax effects. For example, under ASU 2016-16 (effective since 2018): “an entity should recognize the income tax consequences of an intra-entity transfer of an asset other than inventory when the transfer occurs. ... Two common examples of assets included in the scope of this Update are intellectual property and property, plant, and equipment.”

<sup>3</sup> An example of a study that uses a variant of the effective tax rate to evaluate tax avoidance is Dyreng et al. (2017), who measure the effective tax rate using the ratio of worldwide cash taxes paid to pretax accounting earnings. They note: “cash effective tax rates capture all reductions in taxes paid relative to pretax financial accounting income. Thus, our measures are intentionally broad, so that they capture any form of tax reduction relative to pretax accounting income, whether through tax sheltering, location decisions, income shifting, tax preferences within the tax code, or rule changes.”

effective tax rate for forecasting and assessing firm performance, although they often apply adjustments to the reported ETR. For example, Beardsley et al. (2021) provide evidence that analysts often exclude certain items they believe do not reflect current performance, resulting in “street” ETR. Using a hand-collected sample of analyst reports, they find that approximately 35 percent of street ETRs have at least one tax-specific exclusion (e.g., impact of change in tax rate, valuation allowance, or unrecognized tax benefits) and over 90 percent have tax effects of pre-tax exclusions (e.g., restructuring, stock compensation, gains/losses, impairment, noncontrolling interests). In making the adjustments, analysts use information from the income tax footnote (primarily the effective tax reconciliation; see below) as well as from other disclosures (e.g., MD&A, non-GAAP disclosures).

## ***2.2 Statutory tax rate***

Under this approach, the tax rate is measured using the top statutory tax rate in the country of incorporation. There are several issues with this method. First, many companies operate in more than one tax jurisdiction, with different statutory tax rates. Second, in some tax jurisdictions there are multiple layers of taxation (e.g., state and local in the U.S.). Third, tax rates may change with the level of income. Fourth, there are timing and permanent differences between pretax book income and taxable income, with the first type of differences changing the economic tax rate on pretax book income (relative to the statutory rate) due to a discounting effect, and the second changing it due to a cash flow effect.<sup>4</sup>

As a result of the above differences, most companies pay a tax rate substantially lower than the statutory tax rate (see Section 4). Relatedly, several studies show that using the statutory tax rate to measure corporate tax rates results in significant distortions. For example, Cready et al.

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<sup>4</sup> ETR is also subject to the timing (discounting) bias but not to the permanent difference (basis) bias.

(2021) find that using the statutory tax rate to measure aftertax special items (e.g., restructuring charges, asset write-downs) results in substantially biased estimates as the tax rates on these items are significantly lower than the statutory tax rate.

### ***2.3 Effective tax reconciliation***

The effective tax reconciliation is reported by companies in the income tax note. It explains the reasons for the difference between the statutory federal tax rate and the effective tax rate.

Reconciling items include:

- *Adjustments to current income taxes*, including tax credits (e.g., for R&D or investments), changes in tax reserves (called “unrecognized tax benefits” in the U.S.), unreserved prior periods tax payments, stock-based compensation (SBC) excess tax benefits,<sup>5</sup> and possibly other items.
- *State and local taxes* (the reported income tax expense includes state and local taxes in addition to federal taxes).<sup>6</sup>
- The effect of *foreign earnings taxed at rates different than the federal statutory tax rate*.<sup>7</sup>

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<sup>5</sup> SBC excess tax benefits represent the tax benefit (tax cost) of deducting a greater (smaller) amount in the tax return than the amount expensed in the income statement. For example, the employee stock options (ESO) expense is based on grant date fair value, but the deduction is generally based on the stock price at the time of exercise. Since 2017 (ASU 2016-09), any excess tax benefit or shortfall is recognized in the income tax expense (previously most of the amount was recognized directly in equity). The tax benefit (cost) from excess (shortfall) deductions depends on the statutory tax rate—the higher the tax rate, the greater the effect on ETR.

<sup>6</sup> In some countries—including the U.S.—the statutory tax rate includes more than one layer of taxation (e.g., federal and state). In the U.S., the effective tax reconciliation starts with the federal statutory tax rate, with state and local taxes accounted for as reconciling adjustments. In contrast, some IFRS firms start the reconciliation from the combined statutory tax rate (including local taxes), thus omitting this adjustment.

<sup>7</sup> Companies’ income is often subject to taxation in different jurisdictions. In the U.S., the effective tax reconciliation starts with the federal statutory tax rate, with the impact of differences between the foreign and federal tax rates accounted for as reconciling adjustments. In contrast, some IFRS firms use a weighted-average statutory tax rate across the different jurisdictions as the starting point for the reconciliation, in which case the reconciliation does not include an adjustment for foreign tax rates.

- *Permanent differences* between book and taxable income, including non-deductible compensation,<sup>8</sup> interest on state and municipal bonds, most cases of goodwill impairment,<sup>9</sup> dividend received deduction, domestic production deduction (before TCJA), and other items that effect either pretax income or taxable income but not the other.<sup>10</sup>
- *Adjustments to the deferred portion* of the income tax expense, including changes in the valuation allowance (U.S. GAAP) or in unrecognized deferred tax assets (IFRS) and the cumulative impact of changes in tax rates or tax laws on deferred tax assets and liabilities.

Some of the above effects are transitory or at least highly volatile (e.g., goodwill impairment, changes in the valuation allowance), while others are quite stable over time (e.g., state and local taxes). In addition, some are related to operations (e.g., non-deductible compensation, R&D tax credit) while others are related to financing or investing activities (e.g., interest on state issued bonds). Another dimension on which the above effects can be distinguished is the level of discretion associated with their recognition, with items such as changes in unrecognized tax benefits or in the valuation allowance being particularly discretionary. As a final distinction, some items are related to effects on the income tax expense (e.g., R&D tax credits, the impact if changes in tax rates) while others are due to (permanent) differences between book and taxable income

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<sup>8</sup> Provisions of Tax Cut and Jobs Act (TCJA), effective 2018, significantly increased the amount of non-deductible compensation. Section 162(m) prohibits publicly held companies from deducting more than \$1 million per year in compensation paid to senior executive officers. The tax act removed an exemption for commissions and performance-based pay and expanded the scope of covered individuals. The tax cost of not being able to deduct the full SBC expense depends on the statutory tax rate—the higher the tax rate, the greater the effect on the ETR.

<sup>9</sup> Goodwill impairment is generally not recognized for tax purposes. However, as discussed below, in some cases goodwill has a tax basis and is deducted through amortization, which implies that for that goodwill any impairment is eventually recovered for tax purposes (i.e., represents a timing rather than permanent difference).

<sup>10</sup> Unlike permanent differences, timing differences between book and taxable income generally do not impact the ETR because they change the numerator (deferred portion of the income tax expense) by an amount equal to their magnitude times the statutory tax rate. However, as noted below, changes in the tax valuation allowance or in enacted tax rates (or in other tax provisions) require adjusting the deferred portion of income tax expense for the same level of pretax income and therefore impact the ETR.

(e.g., dividend received deduction). Thus, considering information from the income tax reconciliation may help gain insight not just about the recurring (or normal) tax rate and the transitory component of the income tax expense, but also about earnings management and the tax rates on different sources of income (e.g., operating versus financing, recurring versus transitory, domestic versus foreign, R&D-related, labor-related, etc.).

Still, there are several issues with using effective tax reconciliations to estimate the various tax rates. First, companies do not report all reconciling items explicitly, but rather include immaterial ones in the “other” category.<sup>11</sup> Moreover, given that companies have some latitude in assessing materiality, it is likely that not all significant items are reported explicitly. Second, even when disclosed, the effects may not be comparable across firms or over time due to differences in methodology. For example, a company may include the effect of a change in the tax valuation allowance related to foreign operations in the “foreign taxes” reconciling item, or it may include it in the impact of changes in the valuation allowance. This flexibility may also enable companies to classify some effects as immaterial and thus include them in the “other” category. Even for disclosed items, there may not be sufficient transparency regarding their nature and implications.<sup>12</sup> Relatedly, companies may use their reporting discretion to provide deficient information or for

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<sup>11</sup> ASC 740-10-50-12 states: “A public entity shall disclose a reconciliation using percentages or dollar amounts of the reported amount of income tax expense attributable to continuing operations for the year to the amount of income tax expense that would result from applying domestic federal statutory tax rates to pretax income from continuing operations. The statutory tax rates shall be the regular tax rates if there are alternative tax systems. The estimated amount and the nature of each significant reconciling item shall be disclosed.” ASC 740-10-50 does not define the term “significant.” However, SEC Regulation S-X, Rule 4-08(h), states that as part of the reconciliation, public entities should disclose all reconciling items that individually make up 5 percent or more of the computed amount (i.e., income before tax multiplied by the applicable domestic federal statutory tax rate).

<sup>12</sup> The following quote is from a recent SEC comment letter. “We note from your tax rate reconciliation that foreign income taxed at lower rates significantly impacted your effective tax rates. Please help us understand the nature of this reconciling item, including the primary taxing jurisdictions where your foreign earnings are derived and the relevant statutory rates in those jurisdictions. Please also discuss any incentivized tax rates you have been granted and briefly describe the factual circumstances of any tax holidays, the per-share effects of the tax holiday and the date upon which any special tax status terminates. Refer to ASC 740-10-50-12 and SAB Topic 11.C.”



making the disclosure less transparent.<sup>13</sup> Additionally, items that are supposed to be transitory may in fact persist. For example, companies may delay the recognition of some unrecognized tax benefits to reduce scrutiny by the IRS (Hollie et al. 2021), potentially inducing autocorrelation in their ETR effect. Finally, Compustat does not provide effective tax reconciliation data (nor do other “traditional” data providers/aggregators).<sup>14</sup>

Notwithstanding these limitations, recent research that uses information from the income tax reconciliation demonstrates its usefulness. For example, Drake et al. (2020) find that declines in domestic firm ETRs are primarily a function of GAAP accounting rules for valuation allowance releases, rather than deliberate tax planning. Schwab et al. (2021) document that ETRs below 5% and above 40% are significantly influenced by items largely unrelated to tax avoidance, such as valuation allowances and goodwill impairments. They also report that truncating ETRs at zero and one, controlling for standard determinants of tax avoidance, and using industry-size-adjusted ETRs or multiyear GAAP ETRs do not eliminate the clustering of factors largely unrelated to tax avoidance in the tails of the ETR distribution. Cash ETRs attenuate but do not eliminate this clustering.

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<sup>13</sup> For example, when presenting the ETR reconciliation table, firms can choose a format that reveals the tax rate (the percentage format) or one that avoids explicit mention of the effective tax rate (the dollar format). Chychyla et al. (2022) find that firms with low ETRs are 24 percent more likely to use the dollar format and are also less likely to mention their tax rates elsewhere in their disclosures, consistent with the reputational costs associated with disclosing low effective tax rate. They also find that analysts’ tax expense forecasts are less accurate for dollar format firms, suggesting higher processing costs associated with tax-related disclosures for these firms.

<sup>14</sup> Some components can be estimated using Compustat data. For example, the effects of changes in tax reserves can be estimated using data about unrecognized tax benefits, which are available on Compustat. Additional items, such as the impact of equity method earnings, goodwill impairment, and in process R&D (prior to SFAS 141R) can also be estimated. See Section 3.

## ***2.4 Other disclosures***

Finally, companies provide additional disclosures that can be used to supplement or substitute for the other methods in estimating the normal tax rate, identifying transitory ETR components, or predicting changes in ETR. These include:

- (1) The levels of and changes in the valuation allowance and unrecognized tax benefits, including the portions recognized in income;<sup>15</sup> this information can be used to estimate transitory components of the income tax expense and ETR.
- (2) Domestic and foreign pretax income and income taxes; this information can be used to calculate the domestic and foreign ETRs, which in turn can be used to estimate the effect of foreign operations on overall ETR and to predict changes in ETR due to expected changes in the mix of domestic versus foreign income.
- (3) Current versus deferred portions of the income tax expense, the amount of income taxes actually paid during the period, and the items giving rise to deferred tax assets and liabilities; this information can be used to estimate taxable income, evaluate earnings quality, and estimate the likely impact of discounting on the economic tax rate.<sup>16</sup> In addition, large differences between ETR and either ETR based on the current portion or cash ETR may help predict changes in ETR.

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<sup>15</sup> For some tax positions, the uncertainty relates to timing rather than amount. For example, a company may deduct an amount that should be capitalized and amortized over time. In such cases, if a reserve for unrecognized tax benefits is established, it is done against an increase in deferred tax assets rather than an increase in the income tax expense (i.e., no effect on reported income).

<sup>16</sup> Many studies use these disclosures, especially components of the income tax expense, to evaluate tax avoidance or earnings quality. Examples include Lev and Nissim (2004), Hanlon (2005), Desai and Dharmapala (2006), Gleason and Mills (2008), Weber (2009), Wilson (2009), Ayers et al. (2009), Thomas and Zhang (2011), Blaylock et al. (2012), and Balakrishnan et al. (2019).

- (4) MD&A and non-GAAP disclosures. For example, the disclosed or implied tax rates used in measuring adjustments (e.g., the aftertax effect of restructuring charges on EPS), or the tax rate that is applied to an adjusted measure of pretax income to derive the aftertax counterpart.
- (5) Under IFRS, firms disclose not just the components of deferred tax assets and liabilities but also the corresponding temporary differences. The ratios of the two provide estimates of the tax rates that management expects will apply to the related income when the temporary differences reverse (based on applicable tax rates and tax laws that are enacted or substantively enacted).

### **3. Methodology**

In this section I develop and explain the method used to estimate the normal tax rate (NTR)—that is, the effective tax rate that would have been reported by the company if there were no transitory income tax effects. Estimating NTR involves several steps, which are explained in separate subsections: statutory tax rate (3.1), effective tax rate (3.2), and finally relative tax ratios and the normal tax rate (3.3).

#### ***3.1 Statutory tax rate***

I measure the statutory tax rate using the combined corporate income tax rate as estimated by the OECD, which I obtain from <http://stats.oecd.org/> (hereafter combined statutory tax rate or **CSTR**). In some countries there is more than one layer of taxation (e.g., federal and state in the U.S., or corporation and trade/municipal in Germany), and CSTR reflects the net effect of all layers of taxation. The OECD provides estimates of country/year-specific combined tax rates since 2000. I assign tax rates to firm-year observations based on country of incorporation (Compustat's FIC).

For U.S. firms, the combined tax rate includes federal, state, and local taxes, net of the effect of the deductibility of state and local taxes at the federal level, with state and local income taxes calculated using the weighted average of state and local tax rates considering the composition of business income across states and localities. For pre-2000 observations I use the following federal tax rate: 1993-1999 35% and 1989-1992 34%, 1987 40%, and 1985-1986 46%.<sup>17</sup> To estimate the combined tax rate in these years, I assume that the average state and local tax rate was equal to its level in 2000, which was 6.64% (before considering the effect of deductibility at the federal level). (This assumption is reasonable given that the average state and local tax rate showed very little variation during the period 2000-2021, for which data are available.) Specifically, for each year prior to 2000, I estimate the combined statutory tax rate as the sum of the federal tax rate in that year and the product of 6.64% and one minus the federal tax rate. For countries other than the U.S., I assume that the combined tax rate in pre-2000 observations was equal to its level in 2000.<sup>18</sup>

The average statutory tax rate that a company face may differ significantly from CSTR if substantial income is earned in foreign jurisdictions or if the average state tax rate in the states in which the company operates is significantly different from the U.S. average. The approach described below to estimate NTR mitigates the effects of such measurement errors.

### ***3.2 Effective tax rate***

One reason for transitory differences over time and across companies in ETR (the ratio of income taxes to pretax income) is variation in the relative magnitude of nontaxable income items. Another

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<sup>17</sup> As described below, the sample period starts in 1989 but some of the variables require up to four years of past data. All results are robust to the exclusion of pre-2000 observations.

<sup>18</sup> This choice affects about 3% of the observations; all results are robust to the elimination of these observations as well as to starting the sample in 2000.

reason is variation in transitory tax adjustments. To mitigate the impact of these two sources of variation in ETR, I define an adjusted ETR ratio (**AdjETR**), which is measured excluding transitory tax adjustments and nontaxable income items that are identifiable using Compustat information. Specifically, I calculate AdjETR as the ratio of adjusted income taxes to adjusted pretax income, measured as described below.

Adjusted income taxes are measured as income taxes (Compustat's TXT) minus the net increase in unrecognized tax benefits ( $\text{sum}(\text{TXTUBPOSINC}, \text{TXTUBPOSPINC}, -\text{TXTUBPOSDEC}, -\text{TXTUBPOSPDEC}, 0)$ ).<sup>19</sup> I set the net increase in unrecognized tax benefits equal to zero if the balance of unrecognized tax benefits (TXTUBTXTR) is less than 50% of the total amount of “unrecognized tax benefits that, if recognized, would affect the effective tax rate” (TXTUBEND). The reason for this adjustment is that if a relatively large portion of the liability for unrecognized tax benefits is not expected to affect ETR, the amount recognized in the income tax expense may differ substantially from the net increase (or decrease) in the liability.<sup>20</sup>

Adjusted pretax income (**AdjPretaxInc**) is calculated as pretax income (Compustat's PI) minus equity method income (Compustat's ESUB; zero if missing) plus impairment of goodwill (the negative of Compustat's GDWLIP; zero if missing) plus in-process R&D expensed at the time of M&A (the negative of Compustat's RDIP for pre-2009 observations; zero since 2009 or if missing). I next explain these adjustments.

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<sup>19</sup> This adjustment—which includes both the impact of revisions to prior year estimates (TXTUBPOSPINC and TXTUBPOSPDEC) and the current year estimate (TXTUBPOSINC and TXTUBPOSDEC)—has a small positive effect on the predictive ability of NTR. It is arguable that net additions related to current year positions should not be excluded from ETR because they reflect initial expectations of the ultimate tax rate. Empirically, however, this portion of the adjustment also contributes to the predictive ability of NTR, possibly due to measurement error or bias in this highly discretionary estimate.

<sup>20</sup> Unfortunately, Compustat does not provide the valuation allowance, so I cannot account for transitory tax effects due to changes in the valuation allowance. Another important transitory income tax effect that is not provided by Compustat is the impact of changes in tax rates or tax laws.

In most cases little if any income taxes are recognized on equity method income due to (1) the dividend received deduction (for U.S. investees); (2) designation of investees' earnings as permanently reinvested (less important since TCJA but still relevant); (3) foreign tax credits; and (4) territorial taxation (since 2018). In addition, in some cases equity method earnings are reported below the income tax expense. Excluding equity method earnings when measuring ETR helps mitigate variation in ETR due to changes in the magnitude of equity method earnings relative to other sources of income. Of course, when using the resulting tax rate (e.g., in forecasting or in estimating abnormal taxes), it should be applied to pretax income excluding equity method income.<sup>21</sup>

Goodwill impairment is excluded because (1) in most (but not all) cases it has no tax basis (and so its impairment is not tax deductible), and (2) no deferred taxes are recognized on the corresponding book-tax difference.<sup>22</sup> Thus, goodwill impairment reduces pretax income with no offsetting income tax benefit received or recognized (in most cases). In cases where impaired goodwill has a tax basis, the goodwill adjustment introduces measurement error. Empirically, I find that the goodwill adjustment improves the informativeness of NTR, consistent with most cases of impaired goodwill having no tax basis.

Pre-2009 in-process R&D was generally expensed at the time of M&A. I exclude it in measuring AdjETR because, similar to goodwill impairment, in most cases it had no tax basis and no deferred taxes were recognized on the corresponding book-tax difference. In contrast, since 2009 impaired in-process R&D is expensed after the business combination and an offsetting

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<sup>21</sup> As discussed in Section 2, there are additional nontaxable items that are included in pretax book income (e.g., non-deductible compensation, interest on state and municipal bonds). However, Compustat does not provide this information.

<sup>22</sup> Intangible assets other than goodwill also typically have a zero-tax basis, but for them a deferred tax liability is recognized with respect to the corresponding book-tax difference. Accordingly, if these assets are impaired (reducing pretax income), the deferred tax liability is reversed (lowering the income tax expense).

income tax benefit is recognized against the reversal of the deferred tax liability that was created at the time of M&A. In pre-2009 cases where in-process R&D had a tax basis, the in-process R&D adjustment introduces measurement error. However, similar to the goodwill adjustment, I find that the in-process R&D adjustment improves the informativeness of NTR, consistent with most cases of in-process R&D having no tax basis.

I calculate AdjETR even when adjusted pretax income (AdjPretaxInc, the denominator) is negative.<sup>23</sup> I winsorize AdjETR at zero and 125% of the same period's combined statutory tax rate (CSTR). Because negative ETR values are likely due to transitory effects, winsorizing at zero mitigates their effect. For the same reason I winsorize high tax rates. I winsorize at 125% of CSTR (rather than 100%) because some firms operate in states with tax rates above the U.S. average or in countries with a higher combined statutory tax rate than the home country.

Having measured AdjETR, I use it to construct NTR as described below, and then evaluate the informativeness of NTR about future ETR, overall as well as relative to current ETR. **ETR** is defined as the ratio of the income tax expense to pretax income. However, because AdjETR and NTR reflect the tax rate on pretax income excluding equity method income, to make them comparable to ETR I measure ETR relative to pretax income excluding equity method income (i.e., Compustat's PI minus coalesce(ESUB,0)). Another reason for excluding equity method income is that some companies report it below income taxes and/or exclude it from their reported effective tax rate.<sup>24</sup> In any case, this adjustment does not affect the inference (it slightly improves

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<sup>23</sup> Although ETR tends to be particularly volatile when income is negative (e.g., due to adjustments to the valuation allowance), it is still potentially informative in such cases due to tax refunds or to the recognition of deferred tax assets for net operating losses. In addition, excluding observations with negative pretax income would limit the generalizability of the inference and may induce selection bias due to the use of future ETRs as dependent variables (discussed below). In any case, all inferences remain unchanged when setting ETR with negative pretax income equal to missing value.

<sup>24</sup> I do not exclude goodwill impairment and in-process R&D because, unlike equity method income, they represent transitory effects, are always reported above income taxes, and are reflected in reported ETRs.

the informativeness of ETR and thus reduces the documented improvement from using NTR instead of ETR). Finally, I trim values of ETR below zero or above one.

### ***3.3 Relative tax ratios and the normal tax rate***

The next step involves combining information from the previous two steps by defining a relative tax ratio (**RelTaxRatio**):

$$RelTaxRatio = \frac{AdjETR}{CSTR}$$

This ratio measures the extent to which the adjusted effective tax rate (AdjETR) differs from the combined statutory tax rate (CSTR), with a ratio less than (above) one indicating that the company recognized income taxes at a rate lower (higher) than the combined statutory tax rate.

Two important reasons for a difference between AdjETR and CSTR are (1) permanent book-tax differences (e.g., tax exempt interest income, non-deductible compensation);<sup>25</sup> and (2) foreign income designated as permanently reinvested (relevant primarily before TCJA). The effect of both items on AdjETR is proportional to CSTR. Therefore, fluctuations in CSTR do not change the RelTaxRatio. For example, if pretax income is \$100 and taxable income is \$80 due to a \$20 permanent book-tax difference, a decrease in the statutory tax rate from 30% to 20% would reduce the effective tax rate by 8%, from 24% ( $=80 \times 30\% / 100$ ) to 16% ( $=80 \times 20\% / 100$ ). RelTaxRatio before the change is 0.8 ( $=24\% / 30\%$ ) and it remains 0.8 ( $=16\% / 20\%$ ) after the change. Thus, for example, given RelTaxRatio one can predict future effective tax rates under alternative statutory tax rates. Of course, in reality the effective tax rate—and therefore RelTaxRatio—can vary substantially over time, which much of the variation due to transitory effects (see Section 2.1). To

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<sup>25</sup> Unfortunately, these items are not provided by Compustat; if they were, it would have been possible to account for them in the calculation of the *Adjusted Effective Tax Rate* similar to the adjustments for goodwill impairment, equity earnings, and in-process R&D.



mitigate the effects of such variation, I calculate three alternative weighted averages of RelTaxRatio over the current and previous four years: RelTaxRatioAve1 - RelTaxRatioAve3.

**RelTaxRatioAve1** assigns more weight to recent observations:

*RelTaxRatioAve1*

$$= \frac{5 \times RelTaxRatio + 4 \times RelTaxRatio_{-1} + 3 \times RelTaxRatio_{-2} + 2 \times RelTaxRatio_{-3} + RelTaxRatio_{-4}}{15}$$

If fewer than four past years are available, the numerator and denominator are adjusted accordingly. For example, if only one past year is available:

$$RelTaxRatioAve1 = \frac{5 \times RelTaxRatio + 4 \times RelTaxRatio_{-1}}{9}$$

**RelTaxRatioAve2** is also a weighted average of RelTaxRatio in the current and (up to) four past years, except that it uses different weights: the absolute value of adjusted pretax income (AdjPretaxInc). **RelTaxRatioAve3** is measured similarly to RelTaxRatioAve2, except that it only includes years with positive AdjPretaxInc. These choices reflect three considerations: recent past is more relevant than distant past (RelTaxRatioAve1), and low (RelTaxRatioAve2 and RelTaxRatioAve3) or negative (RelTaxRatioAve3) AdjPretaxInc (the denominator of AdjETR) likely results in noisier AdjETR measure.

Next, I set **RelTaxRatioAve** equal to a simple average of the three weighted average relative tax ratios. While this measure assigns greater weight to recent observations (through RelTaxRatioAve1), the most recent RelTaxRatio (which reflects the most recent effective tax rate) is likely to be particularly important in measuring the “normal” relationship between AdjETR and CSTR. Yet, as discussed in Section 2.1, ETR (and therefore RelTaxRatio) can be very volatile due to transitory effects. I therefore measure the final tax ratio (**FinalTaxRatio**) as follows.

If  $RelTaxRatio \geq RelTaxRatioAve$  and  $RelTaxRatioAve < 1.25$ , then

$$w = \frac{RelTaxRatio - RelTaxRatioAve}{1.25 - RelTaxRatioAve}$$

If  $RelTaxRatio = RelTaxRatioAve$  and  $RelTaxRatioAve = 1.25$ , then  $w = 0$

If  $RelTaxRatio < RelTaxRatioAve$  and  $RelTaxRatioAve > 0$ , then

$$w = \frac{RelTaxRatioAve - RelTaxRatio}{RelTaxRatioAve}$$

$$FinalTaxRatio = w \times RelTaxRatioAve + (1 - w) \times RelTaxRatio$$

(Note that since AdjETR is bounded between 0 and  $1.25 \times CSTR$ , all relative tax ratios are bounded between 0 and 1.25, and so the above conditions cover all possibilities.) Finally, I define the normal tax rate (**NTR**):

$$NTR = FinalTaxRatio \times CSTR$$

These specifications imply that when AdjETR is consistent with its past values ( $RelTaxRatio$  is equal to  $RelTaxRatioAve$ ) I use it to measure NTR. However, when  $RelTaxRatio$  is different from  $RelTaxRatioAve$ , I measure **FinalTaxRatio** as a weighted average of  $RelTaxRatio$  and  $RelTaxRatioAve$ , with the weight on  $RelTaxRatioAve$  increasing with the distance between the two. In other words, when AdjETR is inconsistent with its past values, it is more likely to include transitory effects and so I reduce its weight in measuring NTR (and increase the weight of past AdjETR).

An alternative approach to estimate NTR is to skip the  $RelTaxRatio$  step and use average *AdjETR* over recent years. The problem with this approach is that some of the variation in the effective tax rate over time is due to changes in the *CSTR*.<sup>26</sup> For example, if one uses the median effective tax rate during 2016-2018 to estimate the normal tax rate for 2018, the estimate will

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<sup>26</sup> As noted above, changes in the *Combined Statutory Tax Rate* due to fluctuations in state tax rates and in the composition of business income across states are typically very small. However, there were several changes in the federal tax rate during the sample period, some of which quite significant.

substantially overstate the 2018 expected tax rate given the reduction in the 2018 tax rate mandated by TCJA.

Yet another alternative approach to measuring NTR is to use the sum of the current combined statutory tax rate and the firm-specific median difference between the adjusted effective tax rate and the combined statutory tax rate over recent years. However, unlike the relative tax ratio, the difference is likely to change over time for reasons unrelated to transitory income taxes. For example, if pretax income is \$100 and taxable income is \$80 due to a \$20 permanent book-tax difference, a decrease in the statutory tax rate from 30% to 20% would reduce the effective tax rate by 8 percentage points, from 24% ( $=80 \times 30\% / 100$ ) to 16% ( $=80 \times 20\% / 100$ ). The relative tax rate, in contrast, would remain unchanged—0.8 ( $=24\% / 30\%$ ) before the change and 0.8 ( $=16\% / 20\%$ ) after the change.

## **4. Empirical analysis**

### ***4.1 Sample and data***

To construct the sample for the empirical analysis, I start with the Compustat North America Fundamental Annual file and select all observations with consolidated data (CONSOL = “C”), industrial format (INDFMT = “INDL”), standardized data format (DATAFMT = “STD”), domestic company (POPSRC = “D;” including U.S., Canada, and ADR), and USD currency (CURCD = “USD”). I then obtain and merge the combined statutory tax rates from the OECD (see Section 3.1). Next, I calculate all the variables as described in Section 3 and add to each observation future values of ETR in years 1 through 5 (to the extent available). I restrict the sample period to fiscal years 1989 through 2020<sup>27</sup> (which implies that I use data since 1985 given that

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<sup>27</sup> Like Compustat, I assign observations to fiscal year  $t$  if the fiscal year ended between June/ $t$  and May/ $t+1$ .

some of the variables involve up to four years of past data). Finally, I delete observations relating to small firms (annual revenue less than 100 million USD in December 2020 prices). I apply the size filter after calculating all the variables, including past and future values, to mitigate selection bias.

Panel A of Table 1 reports distribution statistics for three tax rates: ETR, AdjETR, and NTR, as well as for the variables defined in the process of calculating NTR. One benefit from calculating AdjETR and NTR is immediately clear. The trimming of extreme values of ETR (below zero or above one) means that for 17.9% ( $= 1 - 99,366/121,024$ ) of the observations ETR cannot be used to measure the firm's tax rate. In contrast, AdjETR and NTR are available for 96.6% ( $= 116,887/121,024$ ) of the observations. In addition, AdjETR and NTR appear to smooth out some differences in tax rates—moving from ETR to AdjETR reduces the standard deviation from 14.6% to 12.8% and moving to NTR further reduces it to 10.7%.

Panel B of Table 2 reports the distribution of country of incorporation. 87.8% of the observations relate to U.S. incorporated firms, while the rest are distributed over many countries. None of the findings reported below are sensitive to the exclusion of non-U.S. incorporated firms.

Table 2 presents time-series means of cross-sectional correlation coefficients (Spearman above the diagonal, Pearson below) among the tax rates variables (ETR, AdjETR, and NTR) as well as component variables used in measuring NTR and future values of ETR. As shown, ETR and AdjETR are highly correlated (0.94 Spearman, 0.88 Pearson) and exhibit similar Spearman correlations with future ETR values. However, AdjETR has higher Pearson correlations with future ETRs, consistent with the adjustments made in its measurement increasing informativeness about future tax rates. NTR shows further improvement as it has higher Spearman and Pearson correlations with future ETRs than ETR and AdjETR; for example, the Pearson correlation

between NTR and ETR(5) is 0.31, compared to 0.25 for ETR and 0.27 for AdjETR. Compared to AdjETR, NTR also has substantially lower correlations with ETR (e.g., 0.75 versus 0.88 Pearson), indicating that the adjustments made in its measurement make it substantially different from ETR.

#### ***4.2 In-sample predictive ability***

Table 3 reports the times-series means and HAC t-statistics of coefficients estimated using cross-sectional (annual) regressions of future ETR on ETR (Panel A) and NTR (Panel B). Comparing the predictive ability of NTR and ETR for future ETR, the results indicate that NTR explains a much larger share of the total variation in future ETR, consistent with the correlation coefficients reported in Table 2. For example, for  $t=5$ , R-squared when using NTR is 10.0% while for ETR it is 6.6%. In addition, while less than one, the coefficient on NTR is much larger than that on ETR. For instance, for  $t=5$ , the coefficient on NTR is 0.452 compared to 0.269 for ETR. Both results suggest that, compared to ETR, NTR provides a much better forecast of future ETR.

Panel C of Table 3 evaluates the predictive ability of a decomposition of ETR into NTR and AbnETR ( $= \text{ETR} - \text{NTR}$ ). As shown, in each of the four regressions ( $t = 1, 3, 5, 7$ ) NTR has a substantially higher coefficient than AbnETR, more than ten times so for  $t=5$  and  $t=7$ . In addition, the improvement in R-squared from adding AbnETR (compare Panel C to Panel B) is small to trivial (for future years 5 and 7). These results indicate the NTR can help identify transitory or at least less persistent income taxes and thus help in evaluating earnings sustainability. Still, AbnETR is significant in each of the regressions, suggesting that considering ETR in addition to NTR may yield more precise predictions, especially for near term ETR.

I next rerun the regressions for the subperiod 2000 to 2020. I do so for two reasons. First, for pre-2000 observations OECD measures of combined statutory tax rates are unavailable, and I use estimates instead (see Section 3.1). Second, accounting for income taxes has changed

considerably since the late 1980 (with permitted early adoption of SFAS 96) and especially since 1993 with the required adoption of SFAS 109.<sup>28</sup> These standards changed the measurement of the deferred portion of the income tax expense to incorporate additional adjustments (e.g., the impact of changes in the valuation allowance and in tax rates), which potentially increased the volatility of ETR. In any case, as shown in the table results are similar when restricting the sample to the period 2000-2020.

### ***4.3 Out-of-sample predictions***

Table 4 evaluates and compares the out-of-sample forecasting accuracy of NTR, AdjETR, and ETR for future values of ETR. Panel A indicates that when using ETR as a proxy for future ETR, the mean absolute error ranges from 7.5 percentage points for ETR(1) to 10.9 percentage points for ETR(7). In contrast, when using NTR, the mean absolute error ranges from 6.7% to 9.5%. The improvement from using NTR instead of ETR is statistically and economically significant for each of the four future years ( $t = 1, 3, 5,$  and  $7$ ). For example, for ETR(5), the mean absolute error declines from 10.4 percentage points to 9.1 percentage point, or 13.2% ( $= [9.1-10.4] / 10.4$ ). Given the inherent volatility and uncertainty of future tax rates, the improvement is indeed substantial. For example, if the mean absolute difference between realized ETR(5) and its expected value based on all available information at time 0 is 8 percentage point, using NTR instead of ETR to forecast ETR(5) would imply a reduction of more than 50% ( $= [9.1-10.4] / [10.4-8]$ ) in the inefficiency of the forecast.

The calculation of NTR involves adjusting reported ETR to get AdjETR, and then applying a smoothing mechanism that utilizes current and past values of AdjETR and the combined

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<sup>28</sup> SFAS 96 was originally scheduled to become effective starting 1989, with early adoption allowed. However, the required effective date was subsequently delayed and eventually cancelled.

statutory tax rate (CSTR). How much of the improvement is due to the first step? Panel B provides the answer—less than half. For example, using AdjETR instead of ETR to forecast ETR(5) reduces the mean absolute error by 5.7%, while using NTR reduces it by 13.2%. Thus, most of the improvement is due to the smoothing mechanism. Panel C shows that the improvement in forecasting accuracy is even bigger when focusing on the more recent period, 2000-2020.

## **5. Summary and conclusion**

This study develops an algorithm that uses past and current values of effective and statutory tax rates to estimate the normal tax rate faced by the firm. The method also considers other information that is available on Compustat, and it incorporates some restrictions and adjustments. The empirical analysis shows that the estimated normal tax rate performs well in predicting ETRs over the intermediate term and in identifying transitory components of reported income taxes.

The approach developed in this study can be used to improve the accuracy of tax rate estimates when conducting quant-type analysis and academic research. It is also useful for generating initial tax rate estimates when conducting fundamental analysis, which can then be further adjusted based on effective tax reconciliations and other data, including non-GAAP disclosures. Finally, the approach can be used to estimate recurring earnings and evaluate earnings quality.

While the empirical analysis demonstrates significant improvement in accuracy from using the normal tax rate instead of ETR in forecasting future ETRs, it does not imply that the normal tax rate is the optimal estimate given the information used in its derivation. It is possible that using time-series regressions or advanced machine learning approaches may yield more accurate estimates. The approach used in this study involves simple statistical analysis, with a low risk of

overfitting but also potentially suboptimal estimates. Future research may provide further improvement.



## Appendix A Variable definitions

This appendix describes how the variables are measured.

ETR = Effective tax rate, the ratio of income taxes to pretax income excluding equity method investments. ETR is trimmed at 0 and 100%.

Adjusted income taxes = income taxes (Compustat's TXT) minus the net increase in unrecognized tax benefits (sum(TXTUBPOSINC, TXTUBPOSPINC, -TXTUBPOSDEC, -TXTUBPOSPDEC, 0)). The net increase in unrecognized tax benefits is set equal to zero if the balance of unrecognized tax benefits (TXTUBTXTR) is less than 50% of the total amount of "unrecognized tax benefits that, if recognized, would affect the effective tax rate" (TXTUBEND).

AdjPretaxInc = Adjusted pretax income = pretax income (Compustat's PI) minus equity method income (Compustat's ESUB; zero if missing) plus impairment of goodwill (the negative of Compustat's GDWLIP; zero if missing) plus in-process R&D expensed at the time of M&A (the negative of Compustat's RDIP for pre-2009 observations; zero if missing).

AdjETR = Adjusted income taxes / Adjusted pretax income. AdjETR is winsorized at zero and 125% of the same period's combined statutory tax rate (CSTR).

CSTR = Combined corporate statutory tax rate as estimated by the OECD (obtained from <http://stats.oecd.org/>), which reflects the net effect of all layers of taxation (in some countries there is more than one layer of taxation, for example, federal and state in the U.S. or corporation and trade/municipal in Germany). The OECD provides estimates of country/year-specific combined tax rates since 2000. Tax rates are assigned to firm-year observations based on country of incorporation (Compustat's FIC). For pre-2000 observations, the following federal tax rate are used: 1993-1999 35%, 1988-1992 34%, 1987 40%, and 1980-1986 46%. The combined tax rate in these years is estimated assuming that the average state and local tax rate was equal to its level in 2000, which was 6.64%. Specifically, for each year prior to 2000, the combined statutory tax rate is estimated as the sum of the federal tax rate in that year and the product of 6.64% and one minus the federal tax rate. For countries other than the U.S., the combined tax rate in pre-2000 observations is assumed to equal its level in 2000 (about 3% of the observations; omitting these observations has no effect on the results).

RelTaxRatio = AdjETR / CSTR

RelTaxRatioAve1 = 
$$\frac{5 \times \text{RelTaxRatio} + 4 \times \text{RelTaxRatio}_{-1} + 3 \times \text{RelTaxRatio}_{-2} + 2 \times \text{RelTaxRatio}_{-3} + \text{RelTaxRatio}_{-4}}{15}$$

If fewer than four past years are available, the numerator and denominator are adjusted accordingly.

RelTaxRatioAve2 = weighted average of RelTaxRatio in the current and (up to) four past years, except that it uses different weights: the absolute value of adjusted pretax income (AdjPretaxInc).

RelTaxRatioAve3 = similarly to RelTaxRatioAve2, except that it only includes years with positive adjusted pretax income (AdjPretaxInc).

RelTaxRatioAve= average of RelTaxRatioAve1, RelTaxRatioAve2, and RelTaxRatioAve3.

w = weight on RelTaxRatioAve when calculating FinalTaxRatio (below).

If  $\text{RelTaxRatio} \geq \text{RelTaxRatioAve}$  and  $\text{RelTaxRatioAve} < 1.25$ , then

$$w = \frac{\text{RelTaxRatio} - \text{RelTaxRatioAve}}{1.25 - \text{RelTaxRatioAve}}$$

If  $\text{RelTaxRatio} = \text{RelTaxRatioAve}$  and  $\text{RelTaxRatioAve} = 1.25$ , then  $w = 0$ .

If  $\text{RelTaxRatio} < \text{RelTaxRatioAve}$  and  $\text{RelTaxRatioAve} > 0$ , then

$$w = \frac{\text{RelTaxRatioAve} - \text{RelTaxRatio}}{\text{RelTaxRatioAve}}$$

$$\text{FinalTaxRatio} = w \times \text{RelTaxRatioAve} + (1 - w) \times \text{RelTaxRatio}$$

$$\text{AbnETR} = \text{ETR} - \text{NTR}$$

$$\text{ETR}(t) = \text{ETR in future year } t, t = 1, \dots, 5.$$

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**Table 1**  
**Distribution statistics**

Panel A: Tax rates and components

|                           | Obs.    | Mean  | StdDev | P5    | Q1    | Median | Q3    | P95   |
|---------------------------|---------|-------|--------|-------|-------|--------|-------|-------|
| <i>ETR</i>                | 99,366  | 31.0% | 14.6%  | 2.2%  | 23.5% | 33.8%  | 38.6% | 50.6% |
| <i>AdjETR (same obs.)</i> | 99,366  | 29.6% | 12.8%  | 1.5%  | 22.9% | 33.2%  | 38.3% | 48.0% |
| <i>NTR (same obs.)</i>    | 99,366  | 29.1% | 10.7%  | 6.3%  | 22.9% | 32.0%  | 37.3% | 41.9% |
| <i>AdjETR</i>             | 116,887 | 26.2% | 15.6%  | 0.0%  | 14.4% | 31.5%  | 38.0% | 48.6% |
| <i>CSTR</i>               | 121,024 | 37.1% | 5.0%   | 25.8% | 38.4% | 39.3%  | 39.3% | 39.3% |
| <i>RelTaxRatio</i>        | 116,887 | 0.708 | 0.409  | 0.000 | 0.412 | 0.852  | 0.994 | 1.250 |
| <i>RelTaxRatioAve1</i>    | 117,202 | 0.712 | 0.326  | 0.026 | 0.517 | 0.807  | 0.958 | 1.110 |
| <i>RelTaxRatioAve2</i>    | 117,202 | 0.713 | 0.332  | 0.019 | 0.522 | 0.822  | 0.958 | 1.098 |
| <i>RelTaxRatioAve3</i>    | 117,202 | 0.751 | 0.332  | 0.011 | 0.601 | 0.855  | 0.978 | 1.164 |
| <i>RelTaxRatioAve</i>     | 117,202 | 0.725 | 0.318  | 0.029 | 0.558 | 0.821  | 0.958 | 1.098 |
| <i>Weight</i>             | 116,887 | 0.343 | 0.382  | 0.000 | 0.034 | 0.148  | 0.637 | 1.000 |
| <i>TaxRatio</i>           | 116,887 | 0.727 | 0.311  | 0.039 | 0.563 | 0.816  | 0.956 | 1.095 |
| <i>NTR</i>                | 116,887 | 27.0% | 12.2%  | 1.4%  | 19.5% | 30.1%  | 36.7% | 41.6% |
| <i>AbnETR</i>             | 99,366  | 1.8%  | 9.5%   | -7.5% | -0.1% | 0.0%   | 1.3%  | 16.9% |

Panel B: Country of incorporation (observations with non-missing ETRs)

|                | Obs.   | Mean   |
|----------------|--------|--------|
| United States  | 87,200 | 87.8%  |
| United Kingdom | 1,519  | 1.5%   |
| Canada         | 1,380  | 1.4%   |
| Japan          | 981    | 1.0%   |
| Netherlands    | 720    | 0.7%   |
| Ireland        | 700    | 0.7%   |
| Israel         | 695    | 0.7%   |
| France         | 552    | 0.6%   |
| Brazil         | 526    | 0.5%   |
| Mexico         | 472    | 0.5%   |
| All others     | 4621   | 4.7%   |
|                | 99,366 | 100.0% |

The sample consists of annual observations over the period 1989 through 2020. All variables are defined in Appendix A.

**Table 2**  
**Correlation coefficients**

|     |                 | V1   | V2    | V3    | V4    | V5    | V6    | V7    | V8    | V9    | V10   | V11   | V12   | V13   | V14   | V15   | V16   |
|-----|-----------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| V1  | ETR             |      | 0.94  | 0.14  | 0.90  | 0.72  | 0.66  | 0.63  | 0.69  | 0.01  | 0.80  | 0.83  | 0.56  | 0.56  | 0.42  | 0.34  | 0.30  |
| V2  | AdjETR          | 0.88 |       | 0.20  | 0.93  | 0.73  | 0.67  | 0.62  | 0.70  | 0.00  | 0.81  | 0.88  | 0.45  | 0.55  | 0.42  | 0.34  | 0.31  |
| V3  | CSTR            | 0.10 | 0.17  |       | -0.07 | -0.06 | -0.05 | -0.06 | -0.06 | -0.06 | -0.05 | 0.23  | -0.06 | 0.15  | 0.14  | 0.13  | 0.13  |
| V4  | RelTaxRatio     | 0.86 | 0.96  | -0.09 |       | 0.78  | 0.72  | 0.68  | 0.75  | 0.04  | 0.87  | 0.79  | 0.50  | 0.50  | 0.37  | 0.30  | 0.27  |
| V5  | RelTaxRatioAve1 | 0.70 | 0.78  | -0.09 | 0.82  |       | 0.94  | 0.85  | 0.97  | -0.20 | 0.92  | 0.85  | 0.10  | 0.49  | 0.39  | 0.32  | 0.28  |
| V6  | RelTaxRatioAve2 | 0.63 | 0.71  | -0.09 | 0.75  | 0.94  |       | 0.89  | 0.98  | -0.22 | 0.91  | 0.84  | 0.03  | 0.50  | 0.39  | 0.33  | 0.28  |
| V7  | RelTaxRatioAve3 | 0.60 | 0.66  | -0.09 | 0.70  | 0.88  | 0.89  |       | 0.93  | -0.12 | 0.86  | 0.78  | 0.01  | 0.47  | 0.38  | 0.32  | 0.28  |
| V8  | RelTaxRatioAve  | 0.66 | 0.74  | -0.09 | 0.78  | 0.97  | 0.98  | 0.95  |       | -0.20 | 0.94  | 0.86  | 0.05  | 0.50  | 0.40  | 0.33  | 0.29  |
| V9  | Weight          | 0.07 | -0.06 | -0.09 | -0.03 | -0.16 | -0.19 | -0.08 | -0.15 |       | -0.16 | -0.18 | 0.21  | -0.07 | -0.06 | -0.05 | -0.04 |
| V10 | TaxRatio        | 0.73 | 0.83  | -0.09 | 0.87  | 0.94  | 0.93  | 0.90  | 0.96  | -0.13 |       | 0.92  | 0.26  | 0.53  | 0.41  | 0.34  | 0.29  |
| V11 | NTR             | 0.75 | 0.88  | 0.22  | 0.82  | 0.89  | 0.88  | 0.85  | 0.90  | -0.17 | 0.94  |       | 0.22  | 0.58  | 0.45  | 0.38  | 0.33  |
| V12 | AbnETR          | 0.72 | 0.42  | -0.08 | 0.45  | 0.13  | 0.03  | 0.02  | 0.06  | 0.28  | 0.13  | 0.10  |       | 0.17  | 0.10  | 0.06  | 0.05  |
| V13 | ETR(1)          | 0.48 | 0.51  | 0.11  | 0.48  | 0.48  | 0.48  | 0.45  | 0.48  | -0.07 | 0.51  | 0.53  | 0.15  |       | 0.48  | 0.39  | 0.33  |
| V14 | ETR(3)          | 0.33 | 0.36  | 0.10  | 0.34  | 0.35  | 0.35  | 0.34  | 0.36  | -0.05 | 0.37  | 0.39  | 0.08  | 0.39  |       | 0.47  | 0.38  |
| V15 | ETR(5)          | 0.25 | 0.27  | 0.09  | 0.25  | 0.28  | 0.28  | 0.27  | 0.28  | -0.03 | 0.29  | 0.31  | 0.04  | 0.29  | 0.37  |       | 0.46  |
| V16 | ETR(7)          | 0.22 | 0.24  | 0.09  | 0.22  | 0.24  | 0.24  | 0.24  | 0.24  | -0.02 | 0.25  | 0.27  | 0.04  | 0.24  | 0.28  | 0.35  |       |

The table presents time-series means of cross-sectional correlation coefficients (Spearman above the diagonal, Pearson below). The sample consists of annual observations over the period 1989 through 2020. All variables are defined in Appendix A.

**Table 3**  
**Regressions evaluating the predictive ability of the normal tax rate (NTR) and the effective tax rate (ETR) for future ETR**

**Panel A: Using ETR(0) to predict ETR(t)**

|                             | t = 1 | t = 3 | t = 5 | t = 7 |
|-----------------------------|-------|-------|-------|-------|
| <i>Intercept</i>            | 0.155 | 0.197 | 0.220 | 0.229 |
|                             | 51.5  | 25.5  | 22.5  | 17.9  |
| <i>ETR(0)</i>               | 0.487 | 0.346 | 0.269 | 0.236 |
|                             | 22.5  | 30.7  | 24.6  | 15.7  |
| <i>Average R-squared</i>    | 0.234 | 0.113 | 0.066 | 0.051 |
| <i>Average observations</i> | 2,638 | 2,314 | 2,060 | 1,837 |

**Panel B: Using NTR(0) to predict ETR(t)**

|                             | t = 1 | t = 3 | t = 5 | t = 7 |
|-----------------------------|-------|-------|-------|-------|
| <i>Intercept</i>            | 0.084 | 0.136 | 0.167 | 0.182 |
|                             | 18.9  | 32.6  | 28.6  | 19.2  |
| <i>NTR(0)</i>               | 0.756 | 0.561 | 0.452 | 0.396 |
|                             | 36.3  | 29.3  | 19.8  | 14.8  |
| <i>Average R-squared</i>    | 0.288 | 0.158 | 0.100 | 0.078 |
| <i>Average observations</i> | 2,638 | 2,314 | 2,060 | 1,837 |

**Panel C: Using the NTR(0) and AbnETR(0) components of ETR(0) to predict ETR(t)**

|                                     | t = 1 | t = 3 | t = 5 | t = 7 |
|-------------------------------------|-------|-------|-------|-------|
| <u>All observations (1989-2020)</u> |       |       |       |       |
| <i>Intercept</i>                    | 0.084 | 0.136 | 0.167 | 0.182 |
|                                     | 23.2  | 31.1  | 27.4  | 19.1  |
| <i>NTR(0)</i>                       | 0.745 | 0.557 | 0.452 | 0.395 |
|                                     | 39.2  | 29.4  | 19.9  | 14.6  |
| <i>AbnETR(0)</i>                    | 0.175 | 0.080 | 0.029 | 0.028 |
|                                     | 15.6  | 6.8   | 2.9   | 2.6   |
| <i>NTR(0)-AbnETR(0)</i>             | 0.570 | 0.478 | 0.423 | 0.366 |
|                                     | 26.0  | 13.2  | 13.3  | 12.1  |
| <i>Average R-squared</i>            | 0.301 | 0.162 | 0.101 | 0.079 |
| <i>Average observations</i>         | 2,638 | 2,314 | 2,060 | 1,837 |
| <u>2000-2020 observations</u>       |       |       |       |       |
| <i>Intercept</i>                    | 0.087 | 0.130 | 0.159 | 0.165 |
|                                     | 19.0  | 25.4  | 21.3  | 21.3  |
| <i>NTR(0)</i>                       | 0.727 | 0.548 | 0.441 | 0.401 |
|                                     | 29.1  | 18.3  | 11.4  | 9.8   |
| <i>AbnETR(0)</i>                    | 0.180 | 0.092 | 0.045 | 0.038 |
|                                     | 11.5  | 5.3   | 3.2   | 2.3   |
| <i>NTR(0)-AbnETR(0)</i>             | 0.547 | 0.457 | 0.396 | 0.364 |
|                                     | 21.7  | 8.2   | 7.9   | 6.9   |
| <i>Average R-squared</i>            | 0.287 | 0.164 | 0.100 | 0.082 |
| <i>Average observations</i>         | 2,448 | 2,183 | 1,980 | 1,800 |

The table presents the times-series means and t-statistics of coefficients estimated using cross-sectional (annual) regressions. The sample consists of annual observations over the period 1989 through 2020. All variables are defined in Appendix A. The t-statistics are calculated using Heteroscedasticity and Autocorrelation Consistent standard errors with two lags (see Greene (2012), page 960, concerning the selection of number of lags).



**Table 4**  
**Comparing the accuracy of future effective tax rate (ETR) forecasts using the normal tax rate (NTR) versus ETR and AdjETR**

**Panel A: All observations (1989-2020)**

|        | Mean absolute error |        | Difference | t-statistic | % difference | Obs.   |
|--------|---------------------|--------|------------|-------------|--------------|--------|
|        | ETR(0)              | NTR(0) |            |             |              |        |
| ETR(1) | 7.5%                | 6.7%   | -0.8%      | -6.3        | -10.5%       | 81,765 |
| ETR(3) | 9.5%                | 8.3%   | -1.3%      | -10.9       | -13.2%       | 67,102 |
| ETR(5) | 10.4%               | 9.1%   | -1.4%      | -18.2       | -13.2%       | 55,607 |
| ETR(7) | 10.9%               | 9.5%   | -1.5%      | -15.5       | -13.3%       | 45,926 |

**Panel B: All observations (1989-2020)**

|        | Mean absolute error |           | Difference | t-statistic | % difference | Obs.   |
|--------|---------------------|-----------|------------|-------------|--------------|--------|
|        | ETR(0)              | AdjETR(0) |            |             |              |        |
| ETR(1) | 7.5%                | 7.1%      | -0.4%      | -7.9        | -5.6%        | 81,765 |
| ETR(3) | 9.5%                | 9.0%      | -0.6%      | -12.8       | -6.0%        | 67,102 |
| ETR(5) | 10.4%               | 9.8%      | -0.6%      | -16.1       | -5.7%        | 55,607 |
| ETR(7) | 10.9%               | 10.3%     | -0.6%      | -15.8       | -5.8%        | 45,926 |

**Panel C: 2000-2020 observations**

|        | Mean absolute error |        | Difference | t-statistic | % difference | Obs.   |
|--------|---------------------|--------|------------|-------------|--------------|--------|
|        | ETR(0)              | NTR(0) |            |             |              |        |
| ETR(1) | 8.1%                | 7.1%   | -0.9%      | -4.6        | -11.5%       | 48,959 |
| ETR(3) | 10.2%               | 8.7%   | -1.5%      | -8.0        | -14.3%       | 39,293 |
| ETR(5) | 11.2%               | 9.6%   | -1.6%      | -14.8       | -13.9%       | 31,687 |
| ETR(7) | 11.8%               | 10.1%  | -1.6%      | -11.1       | -14.0%       | 25,201 |

The table reports statistics from the distribution of errors when predicting ETR in future years 1, 3, 5 and 7 (ETR(1), ETR(3), ETR(5), ETR(7), respectively) using either ETR, AdjETR, or NTR in year 0. The sample consists of annual observations over the period 1989 through 2020. All variables are defined in Appendix A. The t-statistics are calculated using two-ways (firm and year) clustered standard errors (Petersen 2009).