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Incorporating Financial Statement Information to Improve Forecasts of Corporate Taxable Income

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ABSTRACT

We contribute to the research on the information content of earnings as it applies to the forecasting of economic activity across reporting models. We examine whether publicly available financial statement information is incrementally useful in forecasting confidentially reported taxable income. More precise firm-level taxable income forecasts can improve policymakers' modeling of the tax system and their ability to analyze the effect of proposed changes in corporate tax law. When aggregated, improved micro-forecasts can also yield more accurate macro-forecasts of corporate taxable income, a significant component of the federal budget. We find that financial statement information improves firm-level estimates of future taxable income by providing more timely information. We also document the usefulness of the deferred tax valuation allowance in improving taxable income estimates for loss firms. Our evidence suggests public financial statement information complements proprietary data to improve estimates of future taxable income for budgetary and policy use.

Keywords: Taxable income; tax policy; forecasting; financial reporting

JEL Classifications: M41, M48, H25

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I. INTRODUCTION

The objective of financial reporting is to provide users with information useful in making efficient economic decisions (Financial Accounting Standards Board 2010). Prior literature documents the role of accounting data in forecasting firm performance and its usefulness for different economic decisions, at both the micro and macro levels.[1] While the primary purpose of financial reporting is to provide information to investors and creditors, it can also inform the decisions of other stakeholders. For example, accounting variables have been used to inform and influence tax policy and administration (Talisman 2000; U.S. Senate 2003; Boynton, DeFillipes, and Legel 2005) and to predict certain economic indicators, such as inflation and changes in Gross Domestic Product (GDP) (e.g., Konchitchki and Patatoukas 2014a; Nallareddy and Ogneva 2017; Shivakumar and Urcan 2017). While prior literature has documented the important role of accounting information in forecasting some aspects of economic activity, little is known about its value in forecasting tax return variables, which are important inputs to the decisions of fiscal policymakers. Therefore, we examine whether information provided in publicly filed financial statements can improve forecasts of privately reported taxable income.

Understanding whether accounting information can improve estimates of future taxable income is important given the role revenue forecasting plays in the government's budgetary and tax policy process. In particular, generating timely and accurate estimates of corporate tax revenues is important, given that they currently comprise the third largest component of federal tax revenues ($205 billion for fiscal year 2018) and are projected to rise as a share of GDP after 2019 (Congressional Budget Office, 2019). Despite the economic significance of corporate tax revenues to the federal budget, error rates in forecasting this component are significantly higher

[1] See both Kothari (2001) and Ball and Sadka (2015) for a review of the related literatures.

than for other sources of federal revenues. From 1983-2017, the mean absolute error for the Congressional Budget Office's (CBO) corporate income tax revenue projections is 17.4 percent, compared with a mean absolute error of 5.6 percent for all other revenue sources (CBO 2018).

The high error rate in corporate revenue forecasts is due to challenges related to the quality and timeliness of the underlying data used as well as unforeseen economic or legislative changes (CBO 2019). Taxable income forecasting models typically do not include financial statement information; they instead rely primarily on either micro-level or aggregate tax return data, supplemented by broad economic indicators, such as GDP.[2] Tax data shared with other governmental agencies under Internal Revenue Code (IRC) §6103(f)(1) is prepared by the Internal Revenue Service's (IRS) Statistics of Income Division (SOI) with a two-year lag relative to a firm's financial reporting year.[3] As a result, forecasting models often rely on stale tax data to generate timely federal revenue estimates.[4,5] Moreover, private research groups (e.g., Urban-Brookings Tax Policy Center (TPC)) lack access to confidential firm-level tax data. Instead, they rely on publicly available tax return data published by SOI, also at a lag that has been aggregated by asset classes and/or industries. Aggregate data has been shown to mask firm-level heterogeneity in the time-series properties of book and taxable income (Plesko and Weber 2009); thus, its use can lead to less accurate forecasts.

[2] Our review of publicly available information regarding the forecasting models used by certain government agencies and private research groups, as well as conversations with individuals who have experience within those organizations, reveals that financial statement data is generally not incorporated into their standard forecasting models. Only in certain settings do agencies utilize financial statement information when evaluating changes in tax policy. For example, a recent CBO presentation included an examination of 32 companies' disclosures to understand the timing of repatriation transition tax payments following the enactment of the 2017 tax bill. See Saunders-Scott and Shand (2019).

[3] Internal Revenue Code §6103 generally prohibits the disclosure of confidential tax information. One exception, contained in Internal Revenue Code §6103(f)(1), allows disclosure upon written request to the Congressional Committee on Ways and Means, Committee on Finance, and Joint Committee on Taxation.

[4] The methodology for the collection and tabulation of corporation tax returns is described in Internal Revenue Service (2019). Plesko (2006) provides a timeline for the release of SOI tabulations compared to financial reports.

[5] We note that some agencies (e.g., Joint Committee on Taxation) receive a preliminary tax file with a one-year lag.

We argue that including publicly available firm-level financial statement data can improve the forecasting of corporate taxable income for several reasons. First, unlike tax return data, financial statement information is both timely and public. Publicly traded firms are required to file their annual Form 10-K with the Securities and Exchange Commission (SEC) within a short time period following the end of a firm's fiscal year. Firms' tax returns, on the other hand, are non-public and unavailable to users on a real-time basis.[6] Second, financial statement disclosures contain forward-looking information that is not required (or even reportable) on a firm's tax filings. The forward-looking disclosures often incorporate estimates of future financial statement income as well as future taxable income (e.g., deferred tax assets/liabilities and deferred tax asset valuation allowances). Although some estimates may be subjective and based on management assessment, these forward-looking financial statement figures are credible because they are subject to review by an external auditor who attests to the integrity of the information reported by management at the time of the filing. We acknowledge that firms with publicly available financial statements represent only a subset of the corporate population for which revenue estimates are generated. However, corporations with assets over $2.5 billion (primarily publicly traded companies) generate the largest share of both taxable income and total income tax after credits (e.g., 81 percent of the former and 76 percent of the latter in 2015; IRS 2019).

Corporate taxable income forecasts that underlie aggregate revenue estimates can be generated at either a macro or micro level. Forecasting firm-level taxable income that is then aggregated to form a corporate-sector total is preferable to forecasting the aggregate amount

[6] Firms with market value of $700 million or more have a 60-day Form 10-K filing deadline, firms with market value between $75 and $700 million have a 75-day filing deadline, and firms with market value below $75 million have a 90-day filing deadline. By contrast, while a calendar year corporate tax return is due April 15, it is rare for firms to meet this deadline, so an automatic 6-month extension pushes the filing to October.

itself for several reasons. Importantly, firm-level estimates allow more flexibility in the revenue estimation process because they can be used to examine sub-groups of the overall corporate population, such as specific sectors, profitable or loss-generating firms, or firms with/without tax loss carryforwards. Firm-level estimates of future taxable income are also necessary to evaluate how existing and proposed changes in tax policy will affect government revenues and firm behavior because they incorporate more nuanced aspects of the tax system and more accurately reflect the effects of tax policy changes targeted to specific firms, activities, or industries. We, therefore, focus primarily on whether and how accounting data can improve firm-level estimates of corporate taxable income and examine aggregate forecasts in additional analysis.

To test whether firm-level financial statement information can provide information useful to the generation of corporate taxable income forecasts, we merge publicly available financial statement information with privately filed tax return data obtained from the SOI corporate tax return files. We estimate a baseline projection of future taxable income as a function of past taxable income and forecasted GDP. We then include a firm's worldwide pre-tax financial statement income to test the incremental ability of financial statement information to improve the forecast of future taxable income. We find that including firms' pre-tax financial statement income improves the explanatory power of the forecasting model and provides incremental information about future taxable income that is both statistically and economically significant for up to three years ahead. Parsing a firm's financial reporting income into its individual components (e.g., cash and accruals, foreign and domestic) does not substantially improve the explanatory power of the models; however, it does allow us to identify and quantify the sources of incremental information about future taxable income that pre-tax income provides. For example, pre-tax cash flows contribute relatively more information to forecasts of taxable

income than accruals, and pre-tax domestic income exhibits a larger association with future taxable income than foreign earnings.

The inclusion of estimated book-tax differences doubles the explanatory power of the forecasting model over the baseline model. We also observe that book-tax differences are negatively associated with future taxable income, suggesting that as pre-tax financial statement income increases relative to taxable income, future taxable income decreases. This is consistent with Lisowsky (2009), who finds that a firm's estimated book-tax differences can assist in inferring contemporaneous tax status. Neither the disaggregation of total book-tax differences into temporary and permanent components nor the inclusion of deferred tax assets and deferred tax liabilities incrementally improves projections of future taxable income, although they are all statistically significant forecasting parameters.

To ensure that our findings can provide practicable improvements in forecasting methodologies of future taxable income, we conduct out of sample prediction tests using a rolling holdout sample to develop parameter estimates and forecasts of future taxable income. Our results indicate that the forecast models that include pretax income and both pretax income and total book-tax differences outperform the baseline model in terms of forecasting accuracy. Specifically, we find that the inclusion of financial statement information reduces the root mean squared error (RMSE) of taxable income forecasts by between 16 and 22 percent.

We also conduct several additional analyses to complement our primary findings. First, we estimate our models separately for profit and loss firms. While we find financial statement information to be useful in forecasting future taxable income in both sub-samples, the explanatory power of the models is substantially lower for loss firms. Second, we take a less parsimonious approach to the forecasting process and augment our baseline model by including

several additional firm-level variables obtained from financial statements. Although their inclusion does not improve upon forecasts of taxable income for profitable firms, we find that the annual change in firms' valuation allowance is useful in forecasting future taxable income for loss firms (Dhaliwal, Kaplan, Laux and Weisbrod 2013). Third, we document that the primary benefit of including financial statement information in forecasts of taxable income is its timeliness, as opposed to the forward-looking content of accruals. Finally, we provide evidence that aggregate firm-level financial statement variables and taxable income are related, although we interpret our results with caution due to the short time series for which we can generate estimates.

Our findings should be of interest to policymakers and practitioners who generate forecasts of corporate taxable income and/or corporate tax revenue. Collectively, our results suggest that policymakers who currently utilize confidential firm-level tax return data with a lag can use more timely public financial statements to both enhance current forecasting models and generate revenue estimates more quickly. Our results should also be useful to non-governmental agencies and individuals (e.g., academics and private sector forecasters) who generate estimates of taxable income or tax revenues but lack access to confidential information. Our results show that the inclusion of financial statement information in models that traditionally exclude them should improve forecast accuracy.

Apart from the fiscal and tax policy-modelling implications of our results, we make several important contributions to the broader accounting literature that should also be of interest to *financial reporting* policymakers. First, we contribute to the research on the information content of accounting information, specifically as it applies to the forecasting of economic activity (Konchitchki and Patatoukas 2014a; Nallareddy and Ogneva 2017; Shivakumar and

Urcan 2017). These studies focus only on the relevance of financial accounting information in forecasting GDP; we extend them by examining corporate taxable income (and by extension, corporate tax revenues), another important indicator of economic and fiscal health. Objective 10 of the Financial Accounting Standards Board (FASB) Concepts Statement Number 8 states that parties other than investors, creditors and other lenders "may find general purpose financial reports useful" (FASB 2010, 3). Our results suggest the role of financial reporting, because of its timeliness, can extend beyond providing information to investors and creditors by improving the fiscal budgeting and tax policy estimation process. Thus, we demonstrate the competitive advantage of accounting academia as described by Kinney (2001) by exploiting our unique understanding of GAAP financial reporting to improve the tax revenue forecasting process.

We also contribute to the stream of literature that examines the usefulness of financial statement disclosures in inferring contemporaneous tax information (e.g., Lisowsky 2009). We show that financial statement information is not only informative about firms' current tax status, but also about firms' future tax status. Consistent with prior studies (Hanlon 2003; Plesko and Weber 2009; Bokulic, Henry, and Plesko 2012), we show that inferring taxable income using financial statement data remains a challenge for loss firms. We extend these studies by identifying a financial statement accrual, the deferred tax valuation allowance, that can improve estimates of future taxable income for loss firms. This result also extends Dhaliwal et al. (2013), who show that the valuation allowance is associated with the future financial statement income of loss firms. To our knowledge, we are the first to show that changes in the valuation allowance inform forward-looking estimates of taxable income, which is the performance metric GAAP explicitly directs managers to consider when establishing or adjusting the valuation allowance.

II. BACKGROUND AND EXPECTATIONS

The Forecasting Process

Both the government and private sector produce forecasts of corporate taxable income and corporate tax revenues. Aggregate corporate revenue forecasts are a necessary part of the federal budgetary process as they are a component of total government receipts. In evaluating current or proposed tax policy, however, microsimulation models based on individual firms' taxable income are more useful because they allow for estimates of the effects of tax changes targeted to specific firms or groups of firms. Microsimulation models can also be useful to the budgetary process. To the extent that they accurately capture an individual firm's taxable income, the output of a microsimulation model can be aggregated to generate estimates across a myriad of categorization variables (e.g., size, industry, tax status).

Independent research groups and academic researchers are primarily interested in generating firm-level projections of taxable income to form baseline estimates of tax policy changes or to use as inputs in understanding the effect of tax attributes on firms' decisions (e.g., capital structure or investment). Although the ideal unit of observation is firm-level taxable income, private producers of corporate tax revenue forecasts must rely on aggregate data published by the IRS' SOI Division, as firm-level tax information is confidential. For example, the Penn Wharton Model estimates aggregate corporate income as a function of GDP, interest rates, and a measure to capture the difference in tax rates between corporate and non-corporate income.[7] Similarly, Economy.com, owned by Moody's, forecasts aggregate corporate profits as a share of GDP, and includes lagged explanatory variables to control for producer price-level

[7] For detailed information on the Penn Wharton Budget Model, see https://budgetmodel.wharton.upenn.edu/our-model-0.

changes and changes in the price of materials. Finally, Urban-Brookings Tax Policy Center's Business Tax Model relies on aggregate tax return data publicly available from the IRS.[8] Due to changes over time in SOI categorization of industries and asset classes, as well as firm-level heterogeneity in the time-series properties of taxable income that aggregate data ignores (Plesko and Weber 2009), models of future aggregate taxable income based on aggregate inputs may not perform well over a long horizon.

Within the government, the primary sources of corporate taxable income or revenue forecasts are the Council of Economic Advisors (CEA), which produces the macroeconomic outlook used for the President's Budget, and the Congressional Budget Office (CBO), which produces the same information for Congress.[9] Both the CEA and the CBO produce detailed projections of GDP and line items in the federal budget. Within the constraint of maintaining consistency with the GDP-level forecast, these agencies produce forecasts of GDP and federal budget components, including corporate profits, and corporate tax receipts.[10] In addition to aggregate tax return data disclosed by SOI, those involved in budget projections also have access to non-public, micro-level tax return information. However, tax microdata suffers from a different limitation; it is produced with a two-year time lag (e.g., data for 2018 will not be released until September 2020). Thus, models that rely solely on this data do not incorporate all available information about a firm's financial position.

[8] For a detailed description of TPC's Business Tax Model, see https://www.taxpolicycenter.org/resources/documentation-tax-policy-centers-business-tax-model.

[9] While the Federal Reserve also produces economic forecasts, the information it releases is limited and highly aggregated (e.g., GDP, interest rates, civilian unemployment). The information is not disaggregated beyond personal consumption expenditures to the corporate sector.

[10] Federal forecasts are also constrained by the requirement to produce a baseline forecast under the assumption that current law and policies would continue throughout the budget period. For more information, see U.S. Office of Management and Budget (2019), Chapter 26, "Current Services Estimates."

Accounting Earnings and Future Taxable Income

Existing forecasts of corporate taxable income rely almost exclusively on aggregate economic indicators and tax return information that is published with a significant lag. We assert that publicly available financial statement information can improve upon such forecasts because it provides timely information about a firm's financial, and therefore taxable, position. Further, GAAP's accrual-based financial statement information is often forward-looking in nature. Because the goal of the financial accounting system is to provide users with information to make efficient capital allocation decisions, accrual accounting requires the matching of revenue and expenses independent from when cash is received or paid in order to provide a measure of accounting performance that allows financial statement users to estimate future cash flows. Moreover, managers can reveal private information about a firm's current and future performance through discretion in estimating accounting accruals (Subramanyam 1996; Kang, Liu, and Qi 2010).

It is well established in the accounting literature that financial statement earnings are both persistent and slowly mean reverting (e.g., Beaver 1970; Freeman, Ohlson, and Penman 1982; Sloan 1996; Fama and French 2000). Thus, current pre-tax financial statement earnings should contain incremental information about future taxable income to the extent that the two measures of income are correlated. Given that these two measures of income capture the same underlying economic transactions, this is a reasonable assumption (Green and Plesko 2016).

However, financial accounting earnings and related disclosures may not perfectly correlate with taxable income for several reasons. First, the objectives of financial accounting and the tax code are different (Smith and Butters 1949; Manzon and Plesko 2002; and Hanlon 2003). While financial reporting aims to assist in efficient capital allocation, the goals of the IRC

are to raise revenue and reflect policy, such as providing incentives for firms to engage in certain activities. Differences in the underlying goals of the two systems lead to potentially significant differences in the two income measures.[11] Second, differences in consolidation rules for financial accounting and tax reporting can cause the two income measures diverge.[12] Accounting earnings capture performance for a broader set of entities that often does not reflect taxable income for the tax consolidated group, yielding an error rate of approximately 40 percent when attempting to infer even the sign of taxable income from the sign of a firm's pre-tax earnings (Bokulic et al. 2012). Finally, the time series properties of book and taxable income are also different (Plesko and Weber 2009). This suggests that using pre-tax book income (or other characteristics known to explain variations in future book income) to estimate taxable income will likely do so with error. In sum, it is an empirical question whether, or to what extent, financial statement earnings contain information useful in predicting future taxable income.

Components of Accounting Earnings and Future Taxable Income

We also consider whether the disaggregation of accounting earnings into its components can improve the forecasting process of taxable income. A firm's pre-tax financial statement income can be expressed as the sum of its current period cash flows and its accruals, with each component possessing different persistence properties. Beginning with Sloan (1996), a large stream of literature has documented that the accrual component of earnings is less persistent than the cash flow component of earnings (e.g., Xie 2001; Fairfield, Whisenant, and Yohn 2003; Dechow, Richardson, and Sloan 2008; Lewellen and Resutek 2019) due to the high level

[11] Gaertner, LaPlante, and Lynch (2016) show that differences between financial statement and taxable income equate to almost $500 billion in certain years.

[12] Financial statements must include the income of domestic and foreign subsidiaries that are more than 50 percent owned, as well as a share of the income of subsidiaries that are at least 20 percent (but no more than 50 percent) owned by a corporation. For tax purposes, consolidation of domestic entities can be elected (but is not required) when a subsidiary is at least 80 percent owned.

of discretion permitted in establishing accruals. To the extent that accruals reflect measurement errors or earnings management, they are less likely to reoccur in the future.[13] However, prior literature also shows that accruals are forward-looking and contain managers' private information regarding their expectations of future performance and expected future cash flows (Subramanyam, 1996). If this is the case, accruals will be useful in forecasting taxable income. Because it aligns with taxable income more closely and is more persistent, we anticipate that the cash flow component will be more informative about future taxable income than accruals.

A firm's total pre-tax financial statement earnings can also be bifurcated into domestic and foreign earnings. We expect both components to be predictive of future taxable income, but for different reasons. A US multinational firm is taxed on domestic earnings currently and foreign earnings upon repatriation. If it is persistent, we expect domestic financial statement income will possess information relevant to the prediction of future taxable income because it is more closely aligned with a firm's domestic taxable income. Foreign earnings also likely possess information related to future taxable income under a worldwide tax system because they represent future taxable income upon repatriation.[14]

Book-Tax Differences and Future Taxable Income

We also consider whether book-tax differences are incrementally useful to pre-tax income in forecasting future taxable income. While a firm's taxable income is not disclosed within public financial statements, accounting researchers interested in a firm's taxable income often develop estimates using public data. Studies often estimate taxable income by grossing up

[13] Other papers suggest alternative explanations for the accrual anomaly observed in Sloan (1996). For example, Fairfield et al. (2003) argue that it is due to the effect of growth on profitability, whereas Lewellen and Resutek (2019) argue it is the result of a firm's response to demand and supply shocks. We note these alternative explanations for completeness but do not believe the underlying reasoning affects our study.
[14] Some foreign earnings may not be taxable in the U.S. due, for example, to consolidation differences.

current tax expense and then generate a measure of book-tax differences by differencing pre-tax income and estimated taxable income (e.g., Manzon and Plesko 2002; Lisowsky 2009). Thus, book-tax differences estimated from financial statements represent an estimate of a firm's taxable income that can be used to generate revenue estimates when privately disclosed taxable income is unavailable.

There are several challenges to inferring tax status from financial statements, including consolidation differences and the fact that computation of financial statement tax expense is governed by GAAP and not the IRC (see Hanlon, 2003 for a summary of these challenges). Lisowsky (2009) uses financial statement information to infer a firm's tax liability and shows that one can do so reasonably well in a subsample of profitable firms (approximately half of his total sample). However, it is nearly impossible infer tax status from the financial statements of loss firms, which comprise roughly half of the population of publicly traded firms in a given year (Hanlon 2003; Lisowsky 2009; Henry and Sansing 2018). Although a handful of studies link financial statement and tax return information contemporaneously, none examines whether financial statement information is correlated with future tax attributes. Because use of the broader population of firms is necessary to generate accurate income and revenue forecasts, and financial statement information appears to work well only for certain subsets of the population, it is unclear whether book-tax differences will aid in the forecasting process.

Total book-tax differences can be bifurcated into differences that will eventually reverse (temporary differences) and those that will not (permanent differences).[15] We expect the temporary portion of total book-tax differences will be associated with future taxable income

[15] Examples of temporary book-tax differences include depreciation, installment sales, and expense reserves, such as bad debt and warranty expense. Examples of permanent book-tax differences include municipal bond interest, penalties and fines, a portion of meals and entertainment expense, and the dividend received deduction.

because these temporary differences captures income or expense items that are recognized at different times for book and tax purposes. If a firm's pre-tax income is higher (lower) than its estimated taxable income the firm is thought to have "favorable" ("unfavorable") book-tax differences. To the extent that the underlying events that lead to the temporary differences fail to persist, favorable (unfavorable) temporary differences will reverse and taxable income will be higher (lower) in the future than GAAP income. It is unclear whether permanent differences will be a useful forecasting parameter for taxable income. To the extent these permanent differences persist from year-to-year, they should be associated with future taxable income. However, permanent book-tax differences constructed using financial statement data may include items that should not correlate with future taxable income (e.g., tax exempt interest, tax credits, and foreign and state tax rate differentials; Hanlon 2003).

GAAP not only requires firms to report information about total *current* book-tax differences on financial statements, but also requires disclosures that summarize future expected tax payments (deferred tax liabilities, "DTLs") or future tax benefits (deferred tax assets, "DTAs"). DTLs (DTAs) represent the tax effect of future reversals of favorable (unfavorable) current temporary book-tax differences. When DTLs (DTAs) reverse, they will increase (decrease) future taxable income relative to book income. Importantly, DTAs are recorded at the dollar amount of the tax benefit that management expects to realize in the future based on projections of the firm's future taxable income.[16] Consistent with this notion, Laux (2013) provides evidence that DTLs and DTAs provide incremental information about future tax payments that firms disclose on financial reports, although the magnitude of the information is

[16] A firm reports its gross DTAs, which are then reduced by the deferred tax valuation allowance ("VA"). The net result is the amount of future tax benefits that management expects have a greater than 50 percent probability of realization.

small. Because DTLs and DTAs represent future taxable and deductible amounts, respectively, we expect them to be incrementally informative about future taxable income. Specifically, we expect that DTLs (DTAs) will be associated with higher (lower) future taxable income.

III. METHODOLOGY

We first estimate a baseline projection of future taxable income as a function of parameters common to the existing forecast models described in the previous section:

$$TI_{i,t+k} = \alpha_0 + \beta_1 TI_{i,t-3} + \beta_2 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (1)$$

We estimate equation (1) for horizons of up to three-years ahead (k=1, 2, and 3). While non-governmental agencies include only aggregate taxable income figures published by SOI, we include firm-level taxable income at a three year lag ($TI_{i,t-3}$) because it is the best information available to users of tax microdata at the time financial statements are released. We also include in our baseline model one-year ahead forecasts of GDP (GDP_FC_{t+1}).[17] We obtain forecasts of one-year ahead GDP for each of the years included in our sample from CBO's annual Budget and Economic Outlook published in January of each year.

We then augment equation (1) as follows:

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 TI_{i,t-3} + \beta_3 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (2)$$

where $PTI_{i,t}$ is a firm's worldwide pre-tax income as reported in its public financial statements. β_1 is our coefficient of interest and an estimate of it that is statistically different from zero indicates that pre-tax book income contains information useful for estimating future taxable income. We

[17] GDP in year t and the forecast of GDP_{t+1} are very highly correlated (Pearson pairwise correlation of 0.9992, significant at the 0.0001 level). When both current and forecasted GDP are included in our model, the coefficient on GDP is equal to X and the coefficient on the GDP forecast is equal to –X. As a result, we include only the one-year ahead GDP forecast at time t as a forecasting parameter.

also compare the adjusted R^2 of equation (2) to that of equation (1) to determine the extent to which the inclusion of financial statement data improves explanatory power.[18]

We test whether the disaggregation of income into components that have differential implications for taxable income improves projections as follows:

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTCF_{i,t} + \beta_2 PTACC_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (3)$$

$$TI_{i,t+k} = \alpha_0 + \beta_1 PIFO_{i,t} + \beta_2 PIDOM_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (4).$$

In equation (3), we test the incremental information content of a firm's pretax cash flows ($PTCF_{i,t}$) and pre-tax accruals ($PTACC_{i,t}$). $PTACC_{i,t}$ is measured directly from public financial statement information and $PTCF_{i,t}$ is calculated indirectly as the difference between $PTI_{i,t}$ and $PTACC_{i,t}$.[19] A statistically significant estimate of β_1 or β_2 would suggest that the respective component is useful in forecasting future taxable income. If the difference between estimated β_1 and β_2 is significantly positive (negative), then we can further conclude that pre-tax cash flows have relatively more (less) explanatory power for future taxable income than pre-tax accruals. In equation (4), we test the incremental information content of a firm's pre-tax foreign income ($PIFO_{i,t}$) and its pre-tax domestic income ($PIDOM_{i,t}$). Again, a statistically significant estimate of β_1 or β_2 would indicate that foreign and domestic earnings are associated with future taxable income. An estimated value of $\beta_2 > \beta_1$ would indicate that domestic earnings are more relevant to predicting future taxable income than foreign earnings, consistent with domestic earnings being more closely related to taxable amounts. This would also indicate that the deferred domestic tax effect of foreign earnings occurs over longer time periods than estimated in this study. Finally,

[18] We rely on a comparison of adjusted R^2 rather than a Vuong test because the two models use the same dependent variable.

[19] A firm's pre-tax cash flows can also be directly measured from financial statements. Our approach is both consistent with prior literature (e.g., Sloan 1996) and ensures that the sum of a firm's cash flows and accruals is equal to its financial statement income.

we compare the adjusted R^2 of equation (2) separately to equations (3) and (4) to determine whether disaggregation of income improves projections of taxable income.

We then test whether a firm's book-tax differences per its financial reports possess the incremental ability to project taxable income with following three specifications:

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (5)$$

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs\_TEMP_{i,t} + \beta_3 BTDs\_PERM_{i,t} + \beta_4 TI_{i,t-3} + \beta_5 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (6)$$

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 DTA_{i,t} + \beta_4 DTL_{i,t} + \beta_5 TI_{i,t-3} + \beta_6 GDP\_FC_{t+1} + \varepsilon_{i,t+k} \quad (7).$$

Equation (5) tests the incremental information content of a firm's total book-tax differences ($BTDs_{i,t}$) for its future taxable income. *BTD* is the difference between *PTI* and an estimate of taxable income from the financial statements (current federal plus current foreign tax expense, grossed up by the statutory tax rate). Therefore, the sum of β_1 and β_2 captures the forecasting ability of pre-tax income and β_2 captures the incremental forecasting ability of estimated taxable income. A significant estimate of β_2 indicates that financial statement-based estimates of taxable income are useful in revenue forecasting. We also compare the explanatory power of equation (5) to that of equation (2) to quantify any improvement to projections of taxable income.

Equation (6) tests whether the disaggregation of total book-tax differences into their temporary ($BTDs\_TEMP_{i,t}$) and permanent ($BTDs\_PERM_{i,t}$) components improves projections of taxable income. Equation (7) tests whether the cumulative balance of a firm's future deductible amounts (i.e., its deferred tax asset; $DTA_{i,t}$) and the firm's future taxable amounts (i.e., its deferred tax liability; $DTL_{i,t}$) are incrementally useful in projecting taxable income. We expect the estimated value of β_3 in equation (7) will be negative and the estimated value of β_4 will be positive. Finally, we compare the adjusted R^2 from estimating equations (6) and (7) with the adjusted R^2 from estimating equation (5) to determine whether disaggregation of total book-tax

differences into temporary and permanent components or the inclusion of deferred tax assets and liabilities, respectively, further improves the explanatory power of equation (5).

We estimate equations (1) through (7) using ordinary least squares regressions. We follow prior economic forecasting studies in accounting (e.g., Konchitchki and Patatoukas 2014a; Konchitchki and Patatoukas 2014b) and base our statistical inferences on heteroskedasticity and autocorrelation consistent standard errors following the procedure of Newey and West (1987) with a lag length equal to four. We also confirm that our inferences are not sensitive to the use of standard errors clustered by firm.

IV. SAMPLE AND DESCRIPTIVE STATISTICS

Sample

We obtain financial statement data from the Compustat annual dataset, which is updated monthly. Confidential, firm-level corporate tax return data is provided by the IRS's SOI Division. The target sample for the SOI data we use consists of all active, for-profit corporations required to file Form 1120 with the IRS. Because the population of corporate tax return filers is so large, SOI employs a stratified probability sampling procedure designed to represent it.[20]

We merge public financial statement data with a firm's Form 1120 by matching on the firm's employer identification number (EIN) and the last month and year of the firm's financial accounting period. Our sample period begins in 1993 because it is the first year in which Accounting Standards Codification 740 (ASC 740) required firms to report deferred tax assets and liabilities. We end our sample in 2013 because it is the last year for which we have taxable income for year t+3. We restrict our sample to include only firms with calendar year ends to

[20] For detail on the sampling and weighting procedures see IRS (2019).

ensure that the availability of forecasting parameters for a given year are aligned in time. We drop all firms with missing accounting pre-tax income in year *t* and missing taxable income in years *t*-3 and *t*+1 resulting in a base sample of 52,204 firm-year observations. We further restrict samples used in estimates of equations (3) through (8) based on data availability.

Using Compustat data, we construct measures of pre-tax income and book-tax differences from financial reports. We obtain firms' future taxable income ($TI_{i,t+k}$) and the most recent prior period's taxable income ($TI_{i,t-3}$) from the SOI corporate return files. We use a firm's Federal taxable income from Line 30 from Page 1 of a firm's privately filed Form 1120. We focus on taxable income (Line 30) as opposed to tax net income (Form 1120, Page 1, Line 28) because the amount of taxable income is used to compute a firm's total tax liability. Thus, estimating Line 30 provides the best estimate of corporate tax revenues without also requiring separate forecasts of net operating loss deductions. As discussed above, we obtain GDP forecasts from CBO's Budget and Economic Outlook published in January of each year. All continuous, firm-level variables are winsorized at the top and bottom one percent. Detailed variable definitions are presented in Table 1.

Descriptive Statistics

In Figure 1, we visually present the annual pairwise correlation coefficients for pre-tax financial statement and taxable income across the sample period. We find that the correlation between the two measures of income is high for the full sample (0.8427), indicating that parameters useful in forecasting a firm's pre-tax income are likely also useful in forecasting taxable income. However, whether this information is incrementally informative to a firm's past taxable income remains an empirical question. The subset of firms with positive pre-tax income drives the high positive overall correlation between pre-tax financial statement income and

taxable income. For loss firms, the correlation is quite different – the correlation is both lower (in absolute value) and negative (-0.2777), consistent with the idea that taxable income is particularly difficult to infer from financial reports for loss firms (Hanlon 2003; Bokulic et al. 2012). The correlation is negative because reported taxable income is left-bounded at zero while reported pre-tax income is unbounded. The correlation between pre-tax financial statement income and taxable income is generally declining over the sample period.

Table 1 reports descriptive statistics. Over time, average scaled taxable income is increasing, is larger in magnitude than average pre-tax financial statement income and is less variable than pre-tax income (because taxable income is left-bounded at zero). On average, pre-tax accruals are income decreasing and pre-tax cash flow is positive. The average scaled total book-tax difference in our sample is negative (i.e., unfavorable), but also has one of the largest relative and absolute standard deviations. We find permanent differences are the largest component of total book-tax differences. Finally, the average firm in our sample reports deferred tax assets (liabilities), and therefore potential decreases (increases) in future tax liability of 4.42 (4.81) percent of its beginning total assets.

Panel B provides correlation coefficient estimates for the sample, with the highest correlations between the financial statement measures of income and its components. However, consistent with the motivation of this study, we also find firms' future taxable income is significantly correlated with *PTI* and even more highly correlated with components of pre-tax income, particularly cash flows (*PTCF*) and domestic income (*PIDOM*). We report in Panel C that total book-tax differences and the permanent component of book-tax differences are positively and significantly correlated with future taxable income. Temporary book-tax differences are not correlated with future taxable income in value (Pearson correlation) but are

correlated by rank (Spearman correlation). Prior taxable income is positively and significantly correlated with future taxable income, with a Pearson correlation coefficient (0.4516 for $TI_{i,t+1}$) similar to that between future taxable income and cash flows (0.4598 for $TI_{i,t+1}$).

V. EMPIRICAL RESULTS

Accounting Earnings and Future Taxable Income

The first three columns of Table 2, Panel A provide the estimation results of equation (1). Taxable income in *t*-3 is positively and significantly associated with all three years' future taxable income, with coefficients increasing over the forecast horizon from 0.7046 to 0.7372, suggesting that a firm's taxable income is persistent. GDP forecasts are also associated with future taxable income, but the sign is negative, standing in contrast to known models of corporate profits. In untabulated analysis, we confirm that when GDP is the only forecasting parameter, it is positively correlated with future taxable income. However, the inclusion of either prior taxable income or pre-tax income for an individual firm results in the negative coefficient on the GDP forecast.

The next three columns of the table add $PTI_{i,t}$ as an explanatory variable. Across all three equations, $PTI_{i,t}$ is estimated to be positive, significant, and incremental to the information contained in a firm's prior taxable income. Further, similar to taxable income, the information content of pre-tax financial statement income for future taxable income is increasing in the forecast horizon. Regarding the explanatory power of the forecasting model, where the baseline estimation (in column 1) explains 20.74 percent of the variation in a firm's one-year ahead taxable income, the addition of $PTI_{i,t}$ increases the adjusted R^2 of the model to 26.25 percent. This 5.51 percentage point increase in the adjusted R^2 represents a 27 percent improvement over the base model. A similar pattern is seen in the two- and three-year ahead forecasts.

Our results suggest that while taxable income is persistent, incorporating financial statement income into a forecasting model can improve its performance. The incremental information content of $PTI_{i,t}$ is also economically meaningful. A one standard deviation increase in $TI_{i,t-3}$ is associated with a $98 million increase in a firm's one-year ahead taxable income, holding pre-tax income constant. A one standard deviation increase in $PTI_{i,t}$, which is more current than $TI_{i,t-3}$, is associated with an incremental $61 million increase, holding available prior taxable income constant. While the information content of $TI_{i,t-3}$ remains relatively constant across the three-year forecast horizon when $PTI_{i,t}$ is included, the effect of $PTI_{i,t}$ increases, with a one standard deviation increase yielding an $83 million increase in $TI_{i,t+3}$.

Components of Accounting Earnings and Future Taxable Income

In Table 2, Panel B we present the results of estimating equations (3) and (4), which disaggregate pre-tax income into its cash flow and accruals components. To increase comparability between the base model with total PTI and the disaggregate model with PTI components, we re-estimate equation (2) for the subset of firms with non-missing pre-tax accruals and cash flows and report those results in the first three columns of Panel A. We find that splitting pre-tax financial statement income into pre-tax cash flows and accruals provides only a modest improvement in projections of taxable income. The increase in adjusted R^2 is 3.8 percent (1.18 percentage points) for estimates of $TI_{i,t+1}$, 5.8 percent (1.43 percentage points) for estimates of $TI_{i,t+2}$, and 7.2 percent (1.48 percentage points) for estimates of $TI_{i,t+3}$. The results in Panel B of Table 2 also show that while both components of pre-tax income are informative when forecasting, cash flows are more informative than accruals. The economic significance of $PTCF_{i,t}$ is nearly three times that of $PTACC_{i,t}$, with a one standard deviation increase in a firm's pre-tax cash flows (accruals) indicating a $101 ($37) million increase in TI_{t+1}.

Panel C of Table 2 shows that disaggregating pre-tax financial statement income into its domestic and foreign components yields a similarly modest improvement to the baseline model. We find that both $PIFO_{i,t}$ and $PIDOM_{i,t}$ are positive and significant indicators of future taxable income for up to three future periods. Not surprisingly, the magnitude of the coefficient of $PIDOM_{i,t}$ is larger than that of $PIFO_{i,t}$ in all three models; a one standard deviation increase in $PIDOM_{i,t}$ is associated with an increase in $TI_{i,t+1}$ equal to four times the increase in $TI_{i,t+1}$ resulting from a one standard deviation increase in $PIFO_{i,t}$. However, the positive and significant coefficients on $PIFO_{i,t}$ reflect the deferred effect that foreign earnings eventually have on domestic taxable income.

Overall, the results in Table 2 show that while more disaggregate information about a firm's financial reporting income does not substantially improve the explanatory power of the forecasting model over estimates including only pre-tax income, the inclusion of such variables does provide useful insight into *why* a firm's pre-tax financial statement income is informative about a firm's future taxable income. Pre-tax cash flows are a statistically and economically significant indicator of a firm's taxable income for up to three years ahead because pre-tax cash flows are both more persistent than accruals and more closely related to a firm's taxable income. However, accruals are also associated with a firm's future taxable income because they represent expected future cash flows of the firm. A firm's pre-tax domestic income exhibits greater information content than foreign earnings because firms are immediately taxed on domestic earnings and only those foreign earnings repatriated during the year. Foreign earnings have positive information content for future taxable income incremental to domestic earnings because they will enter into taxable income when eventually repatriated.

Book-Tax Differences and Future Taxable Income

In Table 3, we present estimations of equations (5) through (7). The first three columns of Panel A presents the re-estimation of equation (2) using only the subset of firms for which we can compute $BTDs_{i,t}$. We note that in this sample, the coefficient on $PTI_{i,t}$ in the baseline case is smaller than reported in Table 2, Panels B and C, but as discussed above, the total rate of change in TI_{t+k} as a function of changes in $PTI_{i,t}$ is equal to the sum of β_1 and β_2. We find that book-tax differences are incrementally significant and improve the explanatory power of our model. When only $PTI_{i,t}$ is included, the model explains between 16.26 and 24.67 percent of the variation in future taxable income for up to three years ahead. The inclusion of $BTDs_{i,t}$ nearly doubles the explanatory power of the model in each forecasting horizon.

$BTDs_{i,t}$ are significantly and negatively associated with future taxable income. If $BTDs_{i,t}$ are greater than zero, a firm's pre-tax income is larger than its estimated taxable income and the firm is said to have "favorable" book-tax differences. Thus, a negative coefficient estimate for $BTDs_{i,t,}$ indicates that book-tax differences are persistent; as pre-tax income becomes larger relative to estimated taxable income, future taxable income decreases. In economic terms, a one standard deviation increase in $BTDs_{i,t}$ results in a reduction of one-year ahead taxable income equal to approximately $605 million.

In Panel B, we explore the effects of bifurcating book-tax differences into their temporary and permanent components. When separating $BTDs_{i,t}$ into $BTDs\_TEMP_{i,t}$ and $BTDs\_PERM_{i,t}$, we find that both temporary and permanent book-tax differences have similar effects, yielding estimated coefficients nearly identical in magnitude and statistical significance. In Panel C, we include the cumulative total of a firm's favorable ($DTL_{i,t}$) and unfavorable ($DTA_{i,t}$) book-tax differences. We find that $DTA_{i,t}$ and $DTL_{i,t}$ contain information incremental to total book-tax

differences and pre-tax income. As expected, the total of a firm's future tax benefits ($DTA_{i,t}$) is negatively associated with future taxable income and the total future tax liability arising from temporary differences ($DTL_{i,t}$) is positively associated with future taxable income. In both cases, this information is only useful in predicting one-year ahead taxable income. Similar to Laux (2013), we find that the information content of $DTA_{i,t}$ and $DTL_{i,t}$ for future taxable income is quite small in terms of magnitude and the improvement to explanatory power. The results in Table 3 suggest that forecasts of taxable income can be improved by including both pre-tax financial statement income and a firm's total book-tax differences. Although disaggregate information on book-tax differences is available from a firm's tax disclosures, it does not incrementally improve upon the inclusion of a summary measure of book-tax differences.

VI. ADDITIONAL ANALYSES

Out-of-Sample Predictions

The results in the previous sections demonstrate the ability of financial statement information to supplement tax return information when predicting future taxable income. While we document adjusted R^2 improvements in the model estimation, we also evaluate the implications of including financial statement information for forecast accuracy using a rolling holdout sample. For each year, from 1993-2009, seven years of data are used to estimate the parameters of models (1), (2) and (5), with these parameters then used to forecast taxable income for the subsequent three years. We compare these forecasts to actual reported taxable income for the same period to compute forecast errors. The results in Table 4 indicate that models (2) and (5), modified to include $PTI_{i,t}$ and both $PTI_{i,t}$ and $BTDs_{i,t}$, respectively, both outperform the base model in forecasting accuracy. Figure 2 visually displays the results and shows that the root

mean squared errors (RMSE) are consistently higher for the base model across all years of the sample than for either of the alternative models.

Profit Versus Loss Observations

In this section, we re-estimate equations (2) and (5) for separate subsamples of firms with pre-tax income and losses. Previous research has shown that while loss firms comprise an economically meaningful proportion of publicly traded corporations, inferring these firms' taxable income from financial statement information is particularly difficult (Hanlon 2003; Bokulic et al. 2012). Henry and Sansing (2018) show that 76 percent of Compustat firms experience a loss in their lifetime and publicly disclosed SOI data suggests that roughly 40 percent of corporate returns in a given year report zero net income. Prior studies also show that losses are less persistent than positive income (e.g., Hayn 1995; Joos and Plesko 2005; Plesko and Weber 2009), implying that a current period loss is less likely to be reflected in future taxable income. Further, Figure 1 shows a statistically significant positive correlation between pre-tax book and estimated taxable income among firms with positive book income but not among firms with book losses.

In Panel A of Table 5, we present the results of estimating equation (2) separately for profit and loss firms. Across the columns, we note first that the coefficients on $TI_{t\text{-}3}$, while positively associated with future taxable income in all cases, are statistically and economically larger for profitable than for loss firms. We find that for both profit and loss firms, $PTI_{i,t}$ informs forecasts of taxable income for up to three years, incremental to a firm's prior taxable income and GDP forecasts. Among profitable firms, a one standard deviation increase in $PTI_{i,t}$ is associated with a $195 million increase in a firm's one-year ahead taxable income, while among loss firms, a one standard deviation increase in $PTI_{i,t}$ is only associated with an incremental $1

million increase. Further, the adjusted R^2 for profitable firms ranges from 29 to 46 percent, whereas the adjusted R^2 for loss firms ranges from 2 to 4 percent, consistent with the greater ability to forecast taxable income of profitable firms.

In Panel B of Table 5, we separately estimate equation (5) for profit and loss firms. We find that for both subsamples, $BTDs_{i,t}$ are statistically negatively associated with future taxable income for up to three-years ahead. In economic terms, a one standard deviation increase in $BTDs_{i,t}$ results in a reduction of one-year ahead taxable income equal to approximately $103 million for profitable firms and $24 million for loss firms. Similar to $PTI_{i,t}$, the coefficients on $BTDs_{i,t}$ in the loss sample are much smaller than those in the profit sample.

Taken together, the results in Table 5 imply that financial statement information is informative in estimating future taxable income for both profit and loss firms. However, the explanatory power of the models and of key variables is significantly weaker for loss firms. Because the previous models mimic extant parsimonious forecasting models used by private forecasters, we estimate an extended version of previous equations and include a number of additional firm-level variables that may help to forecast future income with the following model:

$$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 CAPEX_{i,t} + \beta_5 FORSALE_{i,t} + \beta_6 MERGERi,_t + \beta_7 TLCF_{i,t} + \beta_8 INTANG_{i,t} + \beta_9 MININT_{i,t} + \beta_{10} EQ\_INC_{i,t} + \beta_{11} TI_{i,t-3} + \beta_{12} GDP\_FC_{i,t+1} + \varepsilon_{i,t+k} \quad (8).$$

The firm level characteristics we include proxy for common drivers of differences between book and tax expenses (Frank and Rego 2009) and include firms' debt levels ($DEBT_{i,t}$), capital expenditures ($CAPEX_{i,t}$), foreign sales ($FORSALE_{i,t}$), merger and acquisition activity

($MERGER_{i,t}$), net operating loss carryforwards ($TLCF_{i,t}$), intangible assets ($INTANG_{i,t}$), and consolidation differences ($MININT_{i,t}$ and $EQ\_INC_{i,t}$).[21]

The results of estimating equation (8) are presented in Panel A of Table 6. We continue to find that the model performs well for profitable firms (adjusted R^2 equal to 0.51), but that the future taxable income of loss firms remains difficult to predict (adjusted R^2 equal to 0.04). For loss firms, the only additional statistically significant characteristic beyond prior taxable income ($TI_{i,t-3}$) is a firm's tax loss carryforwards as reported on its financial statements ($TLCF_{i,t}$), which is consistent with firms offsetting future taxable income with loss carryforwards.

Finally, in Panel B of Table 6, we present the results of estimating equation (8) with the inclusion of an additional control for the annual change in the deferred tax valuation allowance ($\Delta VAA_{i,t}$). $\Delta VAA_{i,t}$ is hand collected from S&P 1500 firms' Form 10-K.[22] To the extent management believes it is "more likely than not" that all or some of a firm's deferred tax assets will not be realized, ASC 740 requires a reduction of their book value to its realizable amount using the valuation allowance (VA). In making this determination, ASC 740 instructs managers to consider the firm's current financial position and expectations of future taxable income. Prior literature provides evidence that the valuation allowance is associated with future book income, specifically for loss firms (Dhaliwal et al. 2013); however, it does not examine whether the VA is associated with future taxable income as ASC 740 explicitly directs. We expect that, to the extent management is able to accurately assess future taxable income, the VA will contain information about a firm's future taxable income and the expected realizable value of its tax loss carryforwards ($TLCF_{i,t}$).

[21] Detailed variable definitions may be found in Table 6.
[22] Focusing on the S&P 1500 keeps hand collection of deferred tax asset and valuation allowance data manageable.

While the change in VA does not appear to be significantly associated with future taxable income for profitable firms, it does exhibit a strong, negative, association with future taxable income for loss firms. This negative association is consistent with increases in valuation allowance among loss firms corresponding to lower realized future taxable income. In addition, when $\Delta VAA_{i,t}$ is included, $TLCF_{i,t}$ is statistically insignificant, implying that the judgment of management in determining and adjusting the valuation allowance is informative about the firm's future performance. The inclusion of $\Delta VAA_{i,t}$ also leads to a marginal improvement in the ability of the model to forecast future taxable income for loss firms, with an increase in adjusted R^2 of 6.5 percent (or 0.5 percentage points).

Characteristics of Accounting Information: Timely and Forward-Looking

We argue that firm-level financial statement information is incrementally informative in forecasting future taxable income because financial statement data is timelier and more forward-looking than tax return data. We empirically test the relative contribution of the timeliness of financial statement information and the forward-looking content of accruals to the improvements in the forecasting process generated by the inclusion of financial statement information in Figure 3. We start with the baseline model in equation (1) and decrease the lag of taxable income included as an explanatory variable to simulate the predictability of future taxable income if tax return data were available sooner. As evidenced by the decreasing slope of the dashed blue line, the magnitude of the coefficient on pre-tax financial statement income decreases as more timely tax return data is included in the model. Similarly, the increasing slope of the dotted green line indicates that the information content of estimated book-tax differences (which have a negative coefficient) is also diminished as more timely tax return data is included in the model. By looking at the coefficient on $PTI_{i,t}$ when $TI_{i,t}$ is included in the model, we gain insight on the

information content of accruals. The coefficient on $PTI_{i,t}$ remains statistically significant, indicating that accruals continue to have incremental predictive ability over contemporaneous taxable income, but the declining magnitude of the coefficient indicates that the bulk of the benefit of including financial statement information is in its timeliness.

Forecasting Aggregate Taxable Income

A developing stream of accounting research examines the information content of accounting aggregates, particularly as they relate to economic activity. For example, studies document that aggregate accounting earnings (or earnings growth) are associated with future GDP growth (Patatoukas 2014; Konchitchki and Patatoukas 2014a; Nallareddy and Ogneva 2017), changes in the Federal funds rate (Gallo, Hann, and Li 2016) and inflation (Shivakumar 2007; Shivakumar and Urcan 2017). Motivated by these studies and the fact that, ultimately, revenue forecasters generate aggregate forecasts of corporate tax revenues, we examine whether aggregate accounting information predicts aggregate corporate taxable income. We run several alternate specifications of our model after aggregating the firm-level data into annual totals. After aggregation, we are left with only 20 to 22 observations (one per year) depending on whether we use one-, two-, or three-year-ahead aggregate taxable income as the dependent variable. The results of these analyses (untabulated) imply that even in the aggregate, financial statement information is incrementally useful in forecasting future taxable income. Although they should be interpreted with caution given the small sample size, the results nonetheless suggest that current public and private sector time series models can be improved by the addition of financial statement variables.

Additional Robustness Tests

We submit our results to several robustness tests. First, we test the robustness of our results to the inclusion of firm-level NOL carryforwards per the tax return. The coefficients on $TI_{i,t\text{-}3}$, $PTI_{i,t}$ and $BTDs_{i,t}$ are nearly identical to those presented in Table 2, Panel A and Table 3, Panel A when NOL carryforwards are included, and significance levels are unchanged. Next, we test whether our results are robust to including book-tax differences as measured from the tax return in year *t*-3 as an explanatory variable, rather than estimating book-tax differences from the financial statements in year *t.* When tax return-based book-tax differences are added to equation (2) the results in Panel A of Table 2 remain quantitatively and qualitatively unchanged, alleviating concerns that our measure of financial statement pre-tax income is simply a proxy for information that could otherwise be gleaned from the most recent tax return available when forecasting.

VII. CONCLUSION

We examine the ability of publicly available financial statement information to improve forecasts of corporate taxable income. Generating timely and well-informed estimates of future taxable income is not only essential to providing more accurate information to the federal budget process, but also in analyzing the revenue effects of changes in tax policy. However, forecasting corporate taxable income is difficult, and existing forecasting models are limited by the underlying data utilized. We demonstrate that efforts to model or simulate the taxation of corporations, even when one has access to otherwise private tax-return information, can benefit from the inclusion of matched financial statement information of the corporation. Pre-tax income and estimated taxable income gleaned from financial statements contain timely, complementary, and forward-looking information that is not present in tax returns. We show that the addition of non-proprietary financial statement information can significantly improve the ability of models

to forecast future taxable income. This result is also important to financial accounting research because it illustrates a specific set of potential users (e.g., governmental bodies and private revenue forecasters and policy analysts) that would benefit from public financial statements, consistent with FASB Concepts Statement 8, Objective 10.

We also show that while forecasting taxable income using financial statement data is a challenge for loss firms, there are specific, firm-level variables – namely, tax loss carryforwards and the valuation allowance – that are useful in predicting future taxable income for loss firms. Last, we provide further evidence to support the conclusion that VA increases are incrementally useful in predicting a loss firm's future performance (Dhaliwal et al. 2013). To our knowledge, we are first to show that changes in the valuation allowance predict future *taxable* income.

While the results of this paper have important implications for both policy and academic research, they also warrant further research to better understand the extent to which revenue and microsimulation models based on tax returns can be improved by the addition of financial statement information. In this paper we focus on a select set of relatively high-level accounting variables and the taxable income of a firm, but it is likely that other aspects of firms' behavior can be better understood though a combination of tax and financial statement information, particularly when the financial statements provide information or detail not included in a tax return. For instance, future research may consider the role of financial reporting quality or the importance of individual components of tax liability in the forecasting process. Future research may also examine how the usefulness of financial statement information to the forecasting process varies over time with changes in financial accounting. Finally, future research may evaluate a broader set of forward-looking information about a firm (e.g., analyst forecasts, management forecasts, non-GAAP earnings) and their usefulness in forecasting taxable income.

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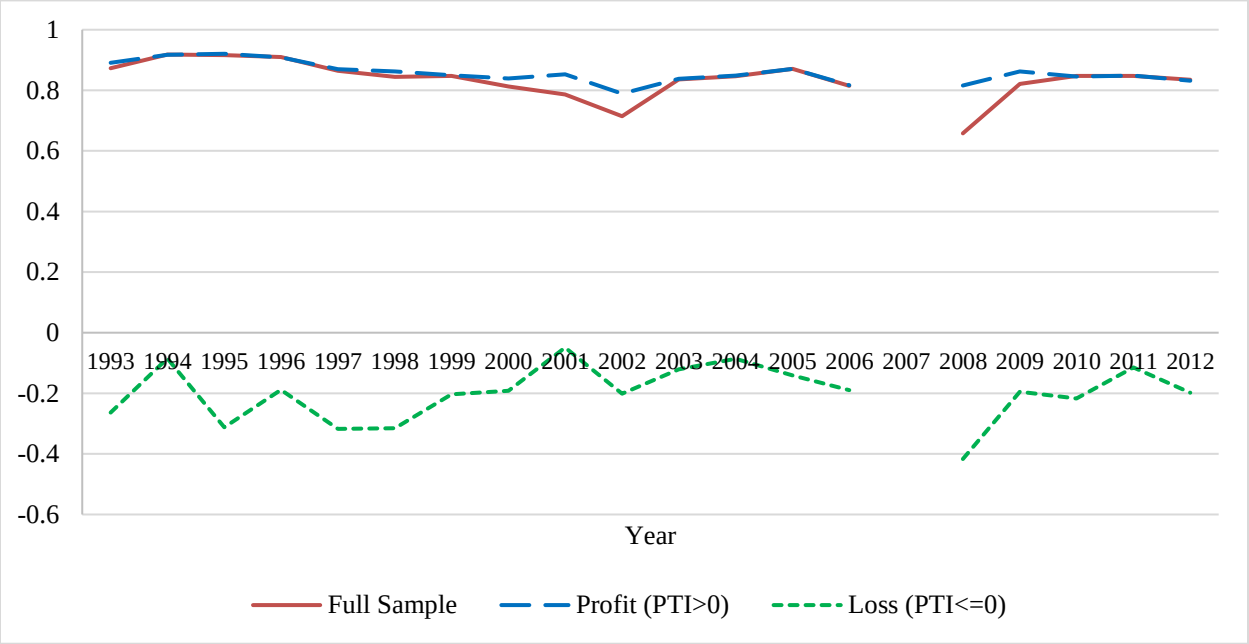
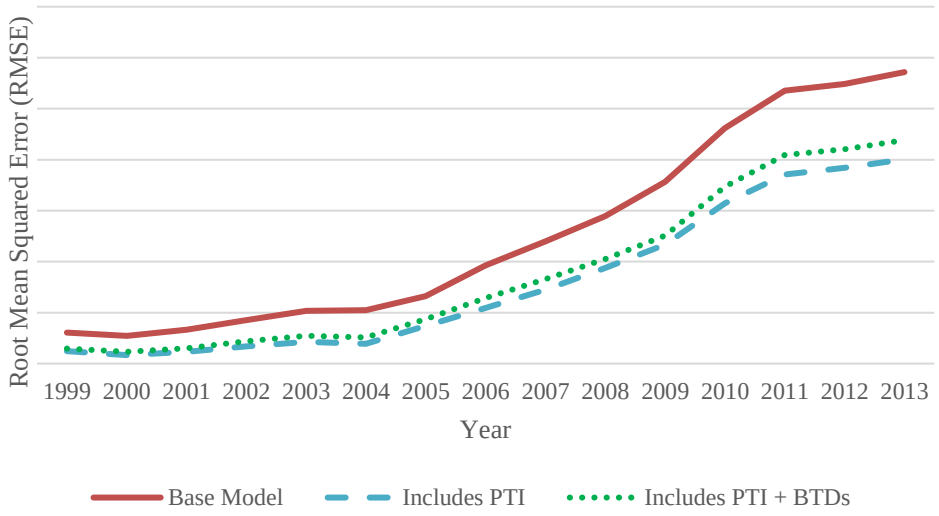
FIGURE 1
Correlation between Pre-tax Income and Taxable income by Year



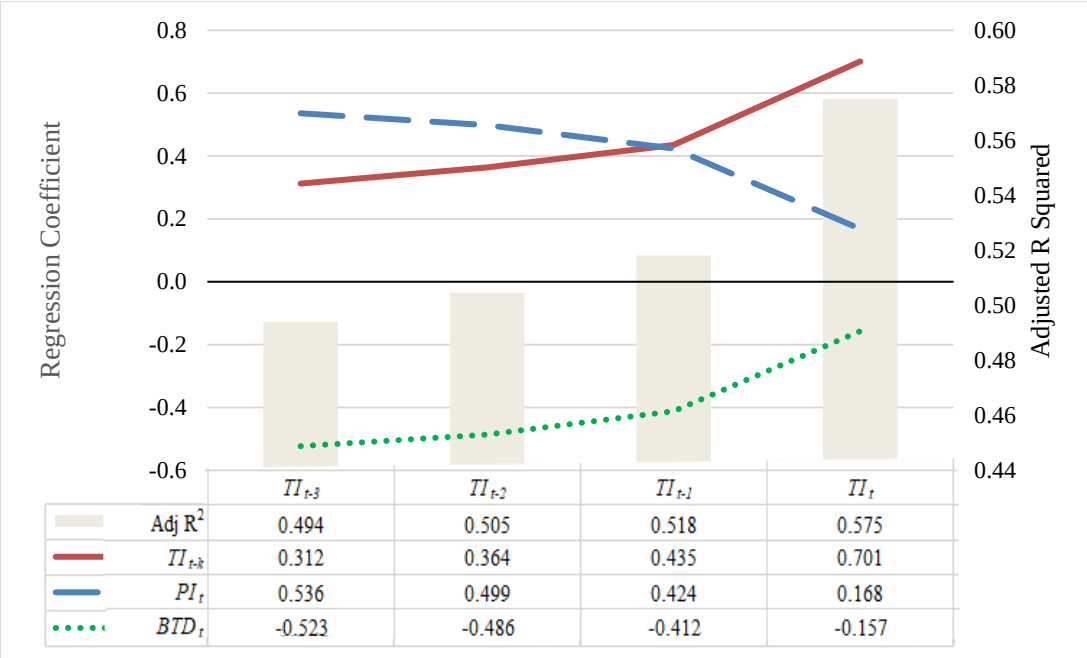
This figure presents correlations between unscaled firm-level measures of pre-tax financial statement and taxable income. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. Pre-tax income (PTI) is a firm's income before taxes from its public financial statements (Compustat PI). Taxable income is from Form 1120, line 30. All variables are winsorized at the 1st and 99th percentile. The data for 2007, 2013, and 2014 are redacted to comply with SOI disclosure policies.

FIGURE 2
Root Mean Squared Errors from Rolling Forecasts of One Year Ahead Taxable Income for Holdout Sample



This figure presents the root mean squared errors (RMSE) of annual future taxable income estimates using a rolling seven year coefficient estimation window to predict one year ahead taxable income. We start with the following base model using equation (1): $TI_{i,t+1} = \alpha_0 + \beta_1 TI_{i,t-3} + \beta_2 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$. We subsequently include additional controls for pretax income in equation (2): $TI_{i,t+1} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 TI_{i,t-3} + \beta_3 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$, and book-tax differences in equation (5): $TI_{i,t+1} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+1}$ is a firm's taxable income for one year ahead. $TI_{i,t-3}$ is a firm's taxable income lagged three years. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. We use unscaled variables in determining annual RMSEs because forecasters are interested solely in gross corporate taxable income and revenues, not measures that are scaled by assets. All continuous, firm-level variables are winsorized at the 1st and 99th percentile.

FIGURE 3
The Contribution of Timeliness versus Accruals to the Information Content of Financial Statement Information for Taxable Income Forecasts



	TI_{t-3}	TI_{t-2}	TI_{t-1}	TI_t
Adj R^2	0.494	0.505	0.518	0.575
TI_{t-k}	0.312	0.364	0.435	0.701
PI_t	0.536	0.499	0.424	0.168
BTD_t	-0.523	-0.486	-0.412	-0.157

This figure presents regression coefficients on $TI_{t-k,}$ PTI_t and BTD_t when estimating equation (5): $TI_{i,t+1} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-k} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ using varying lags of confidential taxable income. This figure also presents the adjusted R squared (in columns) from reducing the lag length of taxable income included in the forecasting model. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+1}$ is a firm's taxable income for one year ahead. $TI_{i,t-k}$ is a firm's taxable income in the current year (i.e., k=0) or up to three years prior (i.e., k=1, k=2, and k=3), scaled by beginning financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI), scaled by beginning financial statement assets (AT). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate, and scaled by beginning total assets. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile.

TABLE 1
Descriptive Statistics for Model Parameters
Scaled dollar amounts in millions (GDP in unscaled $trillions)

Panel A: Summary Statistics

Variable	N	Mean	Std Dev
TI_{t+1}	52,204	0.0382	0.0750
TI_{t+2}	46,116	0.0439	0.0894
TI_{t+3}	40,467	0.0499	0.1035
PTI_t	52,204	-0.0312	0.3070
$PTACC_t$	42,110	-0.0609	0.1173
$PTCF_t$	42,110	0.0836	0.1620
$PIDOM_t$	16,825	0.0146	0.1581
$PIFO_t$	16,627	0.0217	0.0553
$BTDs_t$	37,099	-0.1001	0.3426
$BTDs\_TEMP_t$	40,915	0.0002	0.0644
$BTDs\_PERM_t$	37,021	-0.0998	0.3445
DTA_t	30,692	0.0442	0.0545
DTL_t	30,680	0.0481	0.0620
TI_{t-3}	52,204	0.0257	0.0475
GDP_FC_t	52,204	12.395	3.306

Panel B: Pearson (Spearman) Correlations for Income Variables above (below) main diagonal

	TI_{t+1}	TI_{t+2}	TI_{t+3}	PTI_t	$PTACC_t$	$PTCF_t$	$PIDOM_t$	$PIFO_t$
TI_{t+1}		**0.7529**	**0.6401**	**0.3389**	**0.1177**	**0.4598**	**0.4697**	**0.2004**
TI_{t+2}	**0.7906**		**0.7581**	**0.3130**	**0.0944**	**0.4273**	**0.4212**	**0.1788**
TI_{t+3}	**0.6886**	**0.7900**		**0.2952**	**0.0731**	**0.3974**	**0.3950**	**0.1615**
PTI_t	**0.6157**	**0.5653**	**0.5235**		**0.5495**	**0.7449**	**0.9078**	**0.4647**
$PTACC_t$	**0.1732**	**0.1412**	**0.1116**	**0.3165**		**-0.0611**	**0.5407**	**0.2734**
$PTCF_t$	**0.4889**	**0.4611**	**0.4382**	**0.7249**	**-0.2815**		**0.6908**	**0.4076**
$PIDOM_t$	**0.6244**	**0.5623**	**0.5129**	**0.8925**	**0.3950**	**0.6531**		**0.1939**
$PIFO_t$	**0.2861**	**0.2585**	**0.2402**	**0.5254**	**0.2271**	**0.3995**	**0.2011**	

Panel C: Pearson (Spearman) Correlations for Book-Tax Difference Variables above (below) main diagonal

	TI_{t+1}	TI_{t+2}	TI_{t+3}	$BTDs_t$	$BTDs\_TEMP_t$	$BTDs\_PERM_t$	DTA_t	DTL_t	TI_{t-3}	GDP_FC_{t+1}
TI_{t+1}		**0.7529**	**0.6401**	**0.1883**	0.0007	**0.1872**	**0.0946**	**0.0840**	**0.4516**	**-0.0997**
TI_{t+2}	**0.7906**		**0.7581**	**0.1780**	0.0002	**0.1770**	**0.1013**	**0.0744**	**0.3928**	**-0.0988**
TI_{t+3}	**0.6886**	**0.7900**		**0.1711**	0.0035	**0.1702**	**0.1079**	**0.0655**	**0.3541**	**-0.0963**
$BTDs_t$	**0.3656**	**0.3500**	**0.3343**		**0.1046**	**0.9703**	**0.1634**	**0.1806**	**0.1707**	**-0.0483**
$BTDs\_TEMP_t$	**0.0534**	**0.0554**	**0.0561**	**0.4407**		**-0.1070**	**-0.2095**	**0.1379**	0.0105	-0.0098
$BTDs\_PERM_t$	**0.4163**	**0.3913**	**0.3706**	**0.7385**	**-0.1271**		**0.2122**	**0.1597**	**0.1671**	**-0.0457**
DTA_t	**0.2206**	**0.2258**	**0.2310**	**0.2993**	**-0.0487**	**0.3404**		**0.3947**	**0.0901**	**-0.0807**
DTL_t	**0.2352**	**0.2268**	**0.2187**	**0.3282**	**0.1927**	**0.2011**	**0.6355**		**0.0785**	**-0.0733**
TI_{t-3}	**0.5430**	**0.4980**	**0.4618**	**0.2479**	**0.0142**	**0.3091**	**0.1859**	**0.2145**		**-0.0902**
GDP_FC_{t+1}	**-0.1152**	**-0.1055**	**-0.0975**	0.0118	0.0089	**0.0144**	**-0.0870**	**-0.0672**	**-0.1199**	

This table presents descriptive statistics for variables used in regression analyses. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income from SOI files for up to three years ahead (i.e., k=1, k=2, and k=3) scaled by beginning financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI), scaled by beginning financial statement assets (AT). $PTACC_{i,t}$ is a firm's pre-tax accruals, computed as pre-tax income minus operating cash flow and cash taxes paid, plus cash flows extraordinary items and discontinued operations (PI – OANCF – TXPD + XIDOC), scaled by beginning total assets. $PTCF_{i,t}$ is a firm's pre-tax cash flow, equal to pre-tax income minus pre-tax accruals, scaled by beginning total assets. $PIFO_{i,t}$ is a firm's pre-tax foreign income (PIFO), scaled by beginning total assets. $PIDOM_{i,t}$ is a firm's pre-tax domestic income (PIDOM), scaled by beginning total assets. $BTDs_{i,t}$ are a firm's total BTDs, equal to pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate. $BTD\_TEMPs_{i,t}$ are a firm's temporary BTDs, measured as deferred tax expense (TXDI) divided by the statutory tax rate. $BTD\_PERMs_{i,t}$ are a firm's permanent BTDs, measured as the difference between total BTDs and computed temporary BTDs. All BTD measures are scaled by beginning total assets. $DTA_{i,t}$ is a firm's net deferred tax asset (TXNDBA), scaled by beginning total assets. $DTL_{i,t}$ is a firm's deferred tax liability (TXNDBL), scaled by beginning total assets. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast in trillions of dollars published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. Correlations that are statistically significant at 1 percent or less are indicated in bold.

TABLE 2
Accounting Earnings and Future Taxable Income

Panel A: Baseline Model

$TI_{i,t+k} = \alpha_0 + \beta_1 TI_{i,t-3} + \beta_2 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (1)

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 TI_{i,t-3} + \beta_3 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (2)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0368***	0.0473***	0.0565***	0.0378***	0.0484***	0.0579***
	(24.20)	(23.24)	(21.77)	(30.27)	(28.02)	(25.37)
$PTI_{i,t}$	—	—	—	0.0591***	0.0694***	0.0802***
	—	—	—	(40.27)	(36.90)	(35.29)
$TI_{i,t-3}$	0.7046***	0.7169***	0.7372***	0.6143***	0.6147***	0.6230***
	(60.05)	(51.29)	(44.22)	(54.99)	(45.70)	(38.61)
GDP_FC_{t+1}	-0.0014***	-0.0019***	-0.0023***	-0.0011***	-0.0016***	-0.0020***
	(-12.11)	(-12.12)	(-11.42)	(-12.15)	(-12.33)	(-11.58)
N	52,204	46,116	40,467	52,204	46,116	40,467
Adj. R^2	0.2074	0.1583	0.1295	0.2625	0.2071	0.1741

Panel B: Pre-tax Cash Flows and Accruals

$TI_{i,t+k} = \alpha_0 + \beta_1 PTCF_{i,t} + \beta_2 PTACC_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (3)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0489***	0.0604***	0.0702***	0.0420***	0.0518***	0.0600***
	(31.17)	(28.06)	(24.57)	(26.25)	(23.78)	(20.85)
$PTI_{i,t}$	0.1527***	0.1697***	0.1853***	—	—	—
	(44.17)	(39.94)	(37.42)	—	—	—
$PTCF_{i,t}$	—	—	—	0.1871***	0.2144***	0.2386***
	—	—	—	(42.67)	(39.37)	(37.55)
$PTACC_{i,t}$	—	—	—	0.0954***	0.0977***	0.0998***
	—	—	—	(21.45)	(17.53)	(14.81)
$TI_{i,t-3}$	0.5107***	0.5025***	0.5080***	0.4817***	0.4647***	0.4635***
	(46.40)	(37.56)	(31.17)	(43.07)	(34.33)	(28.20)
GDP_FC_{t+1}	-0.0018***	-0.0024***	-0.0029***	-0.0017***	-0.0023***	-0.0027***
	(-16.33)	(-15.38)	(-13.66)	(-15.30)	(-14.69)	(-13.06)
N	42,110	37,264	32,728	42,110	37,264	32,728
Adj. R^2	0.3103	0.2481	0.2053	0.3221	0.2624	0.2201

Panel C: Foreign and Domestic Pre-tax Income

$TI_{i,t+k} = \alpha_0 + \beta_1 PIFO_{i,t} + \beta_2 PIDOM_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_t + \varepsilon_{i,t+k}$ (4)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0343***	0.0447***	0.0476***	0.0341***	0.0443***	0.0471***
	(13.34)	(12.95)	(10.92)	(13.34)	(12.91)	(10.87)
$PTI_{i,t}$	0.1635***	0.1865***	0.2072***	—	—	—
	(28.21)	(25.88)	(24.28)	—	—	—
$PIFO_{i,t}$	—	—	—	0.1299***	0.1525***	0.1537***
	—	—	—	(9.71)	(8.57)	(7.16)
$PIDOM_{i,t}$	—	—	—	0.1793***	0.2024***	0.2297***
	—	—	—	(24.96)	(22.65)	(22.57)
$TI_{i,t-3}$	0.4834***	0.4663***	0.4864***	0.4775***	0.4609***	0.4782**
	(29.41)	(23.95)	(20.68)	(29.08)	(23.74)	(20.49)
GDP_FC_{t+1}	-0.0006***	-0.0011***	-0.0012***	-0.0006***	-0.0011***	-0.0010***
	(-3.55)	(-4.57)	(-3.62)	(-3.22)	(-4.28)	(-3.27)
N	15,014	13,239	11,576	15,014	13,239	11,576
Adj. R^2	0.3274	0.2635	0.2271	0.3305	0.2649	0.2303

This table reports results from regressions of future taxable income at the firm-level on a firm's financial reporting pre-tax income, prior period taxable income, and forecasted GDP. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income for up to three years ahead (i.e., k=1, k=2, and k=3) scaled by beginning of period financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income for year t (PI), scaled by beginning of period financial statement assets (AT). $TI_{i,t-3}$ is a firm's prior period taxable income (Form 1120, Line 30), scaled by beginning of period financial statement assets. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. In panels B and C we regress firm-level taxable income on individual components of a firm's financial reporting pretax income. $PTACC_{i,t}$ is a firm's pre-tax accruals, computed as pre-tax income minus operating cash flow and cash taxes paid, plus cash flows extraordinary items and discontinued operations (PI – OANCF – TXPD + XIDOC), scaled by beginning total assets. $PTCF_{i,t}$ is a firm's pre-tax cash flow, computed as pre-tax income minus pre-tax accruals, scald by beginning total assets. $PIFO_{i,t}$ is a firm's pre-tax foreign income (PIFO), scaled by beginning total assets. $PIDOM_{i,t}$ is a firm's pre-tax domestic income (PIDOM), scaled by beginning total assets. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. In parentheses, we report Newey and West (1987) heteroskedasticity and autocorrelation consistent t-statistics with four lags. Statistical significance at the 1, 5, and 10 percent levels are indicated by ***, **, and *, respectively.

TABLE 3
Book-tax Differences and Future Taxable Income

Panel A: Total Book-tax Differences

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (5)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0460***	0.0576***	0.0665***	0.0199***	0.0305***	0.0393***
	(25.85)	(23.81)	(21.31)	(12.83)	(13.75)	(13.28)
$PTI_{i,t}$	0.0572***	0.0672***	0.0772***	0.5360***	0.5337***	0.5194***
	(35.55)	(33.13)	(31.82)	(32.58)	(28.40)	(25.18)
$BTDs_{i,t}$	—	—	—	-0.5232***	-0.5145***	-0.4931***
	—	—	—	(-29.96)	(-25.69)	(-22.39)
$TI_{i,t-3}$	0.5842***	0.5755***	0.5773***	0.3124***	0.3138***	0.3324***
	(45.44)	(37.75)	(31.97)	(22.46)	(18.74)	(16.99)
GDP_FC_{t+1}	-0.0013***	-0.0017***	-0.0020***	-0.0008***	-0.0012***	-0.0014***
	(-9.82)	(-9.61)	(-8.47)	(-7.89)	(-7.68)	(-6.66)
N	37,099	32,751	28,692	37,099	32,751	28,692
Adj. R^2	0.2467	0.1933	0.1626	0.4940	0.3655	0.2857

Panel B: Temporary and Permanent Book-tax Differences

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs\_TEMP_{i,t} + \beta_3 BTDs\_PERM_{i,t} + \beta_4 TI_{i,t-3} + \beta_5 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (6)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0199***	0.0305***	0.0393***	0.0226***	0.0329***	0.0418***
	(12.83)	(13.76)	(13.28)	(14.53)	(14.82)	(14.16)
$PTI_{i,t}$	0.5369***	0.5346***	0.5203***	0.4873***	0.4925***	0.4810***
	(32.88)	(28.67)	(25.39)	(32.94)	(28.94)	(26.09)
$BTDs_{i,t}$	-0.5242***	-0.5154***	-0.4940***	—	—	—
	(-30.24)	(-25.95)	(-22.59)	—	—	—
$BTDs\_TEMP_{i,t}$	—	—	—	-0.4743***	-0.4752***	-0.4468***
	—	—	—	(-31.53)	(-25.21)	(-20.60)
$BTDs\_PERM_{i,t}$	—	—	—	-0.4705***	-0.4696***	-0.4513***
	—	—	—	(-30.33)	(-26.27)	(-23.30)
$TI_{i,t-3}$	0.3123***	0.3137***	0.3320***	0.3371***	0.3341***	0.3509***
	(22.49)	(18.79)	(17.00)	(25.13)	(20.67)	(18.58)
GDP_FC_{t+1}	-0.0008***	-0.0012***	-0.0014***	-0.0008***	-0.0012***	-0.0015***
	(-7.87)	(-7.68)	(-6.65)	(-8.00)	(-7.76)	(-6.87)
N	37,021	32,682	28,634	37,021	32,682	28,634
Adj. R^2	0.4939	0.3658	0.2858	0.4684	0.3512	0.2746

Panel C: Book-Tax Differences and Deferred Tax Assets and Liabilities

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 DTA_{i,t} + \beta_4 DTL_{i,t} + \beta_5 TI_{i,t-3} + \beta_6 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (7)

	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0235***	0.0401***	0.0507***	0.0241***	0.0403***	0.0512***
	(7.93)	(9.07)	(8.98)	(7.57)	(8.59)	(8.55)
$PTI_{i,t}$	0.5464***	0.5500***	0.5231***	0.5487***	0.5508***	0.5222***
	(23.06)	(20.43)	(18.47)	(23.59)	(20.75)	(18.59)
$BTDs_{i,t}$	-0.5359***	-0.5347***	-0.5023***	-0.5381***	-0.5354***	-0.5011***
	(-21.44)	(-18.75)	(-16.66)	(-21.83)	(-18.92)	(-16.65)
$DTA_{i,t}$	—	—	—	-0.0413***	-0.0138	0.0113
	—	—	—	(-3.77)	(-0.91)	(0.61)
$DTL_{i,t}$	—	—	—	0.0267***	0.0089	-0.0164
	—	—	—	(3.57)	(0.86)	(-1.30)
$TI_{i,t-3}$	0.3222***	0.3215***	0.3527***	0.3213***	0.3212***	0.3531***
	(16.15)	(13.57)	(13.31)	(16.25)	(13.63)	(13.36)
GDP_FC_{t+1}	-0.0011***	-0.0019***	-0.0023***	-0.0011***	-0.0019***	-0.0024***
	(-5.84)	(-6.56)	(-6.12)	(-5.86)	(-6.53)	(-6.12)
N	22,673	19,681	16,895	22,673	19,681	16,895
Adj. R^2	0.5199	0.3982	0.324	0.5207	0.3982	0.324

This table reports results from regressions of firm-level future taxable income on a firm's financial reporting pre-tax income, book-tax differences, prior period taxable income, and forecasted GDP. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income for up to three years ahead (i.e., k=1, k=2, and k=3), scaled by beginning financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI), scaled by beginning financial statement assets (AT). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate. $BTD\_TEMPs_{i,t}$ are a firm's temporary BTDs, measured as deferred tax expense (TXDI) divided by the statutory tax rate. $BTD\_PERMs_{i,t}$ are a firm's permanent BTDs, measured as the difference between total BTDs and computed temporary BTDs. All BTDs are scaled by beginning total assets. $DTA_{i,t}$ is a firm's net deferred tax asset (TXNDBA) scaled by beginning total assets. $DTL_{i,t}$ is a firm's deferred tax liability (TXNDBL) scaled by beginning total assets. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. In parentheses, we report Newey and West (1987) heteroskedasticity and autocorrelation consistent t-statistics with four lags. Statistical significance at the 1, 5, and 10 percent levels are indicated by ***, **, and *, respectively.

TABLE 4
Parameter Estimates for Rolling Holdout Sample

Panel A: Coefficient Estimates using 1993-2009 Data

$TI_{i,t+k} = \alpha_0 + \beta_1 TI_{i,t-3} + \beta_2 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (1)

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 TI_{i,t-3} + \beta_3 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (2)

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (3)

	(1)			(2)			(3)		
	TI_{t+1}	TI_{t+2}	TI_{t+3}	TI_{t+1}	TI_{t+2}	TI_{t+3}	TI_{t+1}	TI_{t+2}	TI_{t+3}
α_0	**16.0596**	**20.4575**	**19.9297**	**16.3778**	**21.1026**	**20.6499**	**11.6663**	9.8676	11.0502
$PTI_{i,t}$				**0.358**	**0.3546**	**0.3689**	**0.4749**	**0.4689**	**0.4955**
$BTDs_{i,t}$							**-0.3196**	**-0.3448**	**-0.3566**
$TI_{i,t-3}$	**0.961**	**1.0186**	**1.0651**	**0.4324**	**0.4958**	**0.5207**	**0.3391**	**0.4214**	**0.4055**
GDP_FC_{t+1}	0.0004	0.0002	0.0006	-0.0003	-0.0005	-0.0002	-0.0002	0.0001	0.0003

Panel B: Forecasting TI for 2010-2016 Holdout Sample

	(1)			(2)			(3)		
	TI_{t+1}	TI_{t+2}	TI_{t+3}	TI_{t+1}	TI_{t+2}	TI_{t+3}	TI_{t+1}	TI_{t+2}	TI_{t+3}
Mean Predicted TI	135.848	146.797	157.651	169.63	178.739	190.063	176.042	188.863	201.036
(Std Dev Predicted TI)	(438.582)	(464.273)	(461.191)	(544.797)	(561.017)	(563.554)	(578.304)	(602.717)	(607.712)
Mean Actual TI	173.384	194.887	220.255	173.384	194.887	220.255	197.222	222.821	251.231
(Std Dev Actual TI)	(680.047)	(749.324)	(832.046)	(680.047)	(749.324)	(832.046)	(756.847)	(846.428)	(928.711)
Mean FE	-37.535	-48.09	-62.604	-3.753	-16.148	-30.192	-21.18	-33.959	-50.195
(Std Dev FE)	(443.238)	(552.876)	(585.904)	(340.538)	(406.151)	(474.408)	(373.888)	(456.614)	(529.178)
Mean Absolute FE	123.537	146.542	168.441	103.881	122.658	144.368	105.513	129.53	155.597
(Std Dev Absolute FE)	(427.324)	(504.217)	(564.648)	(324.327)	(387.521)	(452.912)	(359.315)	(439.169)	(508.266)
RMSE	269.494	301.249	322.501	209.522	241.49	269.597	232.914	273.132	299.842

This table reports results from using a rolling holdout sample to develop parameter estimates and forecast future taxable income. For each year, from 1993-2009, seven years of data are used to estimate parameters and then forecast taxable income ($TI_{i,t+k}$) for the subsequent three years (i.e., k=1, k=2, and k=3). Panel A presents coefficient estimates and Panel B presents predicted taxable income, actual taxable income, the mean signed forecast error, the mean absolute forecast error and the root mean squared error. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income for up to three years ahead (i.e., k=1, k=2, and k=3). $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate.. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. Statistical significance at the 1 percent level is indicated by bolded coefficients.

TABLE 5
Profit Versus Loss Observations

Panel A: Accounting Earnings

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 TI_{i,t-3} + \beta_3 GDP\_FC_{t+1} + \varepsilon_{i,t+k}$ (2)

	Profit (PTI > 0)			**Loss (PTI <= 0)**		
	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0135***	0.0227***	0.0311***	0.0087***	0.0151***	0.0243***
	(10.55)	(12.31)	(12.41)	(8.03)	(8.36)	(9.05)
$PTI_{i,t}$	0.4612***	0.4889***	0.4973***	0.0023***	0.0040***	0.0083***
	(55.07)	(45.81)	(39.39)	(4.37)	(4.99)	(8.57)
$TI_{i,t-3}$	0.4269***	0.4085***	0.4196***	0.1346***	0.1692***	0.1825***
	(36.28)	(27.19)	(22.88)	(8.11)	(8.35)	(7.29)
GDP_FC_{t+1}	-0.0012***	-0.0017***	-0.0022***	-0.0004***	-0.0006***	-0.0010***
	(-12.58)	(-12.06)	(-10.75)	(-4.96)	(-4.76)	(-5.17)
N	35,811	31,955	28,366	16,393	14,161	12,101
Adj. R^2	0.4599	0.3608	0.2904	0.0364	0.0276	0.0237

Panel B: Total Book-tax Differences

$TI_{i,t+k} = \alpha_0 + \beta_1 PTI_{i,t} + \beta_2 BTDs_{i,t} + \beta_3 TI_{i,t-3} + \beta_4 GDP\_FC_{t} + \varepsilon_{i,t+k}$ (5)

	Profit (PTI > 0)			**Loss (PTI <= 0)**		
	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$	$TI_{i,t+1}$	$TI_{i,t+2}$	$TI_{i,t+3}$
α_0	0.0142***	0.0257***	0.0344***	0.0085***	0.0145***	0.0227***
	(7.33)	(9.17)	(9.14)	(6.88)	(7.01)	(7.57)
$PTI_{i,t}$	0.5986***	0.5965***	0.5824***	0.0943***	0.1105***	0.0959**
	(37.41)	(32.64)	(28.29)	(3.67)	(3.11)	(2.32)
$BTDs_{i,t}$	-0.4187***	-0.3538***	-0.3176***	-0.0928***	-0.1072***	-0.0885***
	(-11.80)	(-9.43)	(-8.01)	(-3.61)	(-3.01)	(-2.13)
$TI_{i,t-3}$	0.2956***	0.2913***	0.3143***	0.1621***	0.2050***	0.2094***
	(17.08)	(14.50)	(13.41)	(7.89)	(8.44)	(7.41)
GDP_FC_{t+1}	-0.0010***	-0.0016***	-0.0019***	-0.0004***	-0.0006***	-0.0009***
	(-6.84)	(-7.40)	(-6.45)	(-4.20)	(-3.78)	(-3.78)
N	23,439	20,988	18,679	13,660	11,763	10,013
Adj. R^2	0.4810	0.3479	0.2680	0.0529	0.0397	0.0282

This table reports results from estimating regressions separately for profit and loss firm-year observations. Profit observations are those with pre-tax financial statement income greater than zero, while loss observations are those with pre-tax financial statement income equal to or less than zero. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income for up to three years ahead (i.e., k=1, k=2, and k=3), scaled by beginning financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI), scaled by beginning financial statement assets (AT). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate. BTDs are scaled by beginning total assets. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. In parentheses, we report Newey and West (1987) heteroskedasticity and autocorrelation consistent t-statistics with four lags. Statistical significance at the 1, 5, and 10 percent levels are indicated by ***, **, and *, respectively.

TABLE 6
Incremental Effects of Firm-Level Characteristics

Panel A: Firm-level Characteristics Excluding Change in VA

	Profit (PI > 0)	**Loss (PI <= 0)**
	$TI_{i,t+1}$	$TI_{i,t+1}$
α_0	0.0198***	0.0043***
	(6.23)	(2.59)
$PTI_{i,t}$	0.6339***	0.0255
	(29.58)	(0.51)
$BTDs_{i,t}$	-0.4559***	-0.0247
	(-10.10)	(-0.49)
$DEBT_{i,t}$	-0.0099***	-0.0008
	(-2.75)	(-0.81)
$CAPEX_{i,t}$	-0.0257***	-0.0007
	(-2.57)	(-0.24)
$FORSALE_{i,t}$	-0.0219***	0.0003
	(-6.67)	(0.13)
$MERGER_{i,t}$	-0.0007	0.0017
	(-0.36)	(1.26)
$TLCF_{i,t}$	-0.0054***	-0.0003***
	(-3.12)	(-2.87)
$INTANG_{i,t}$	0.0083**	0.0008
	(2.00)	(0.35)
$MININT_{i,t}$	-0.5935**	0.0090
	(-2.20)	(0.06)
$EQ\_INC_{i,t}$	0.3209	-0.0901
	(1.48)	(-0.70)
$TI_{i,t-3}$	0.2562***	0.1402***
	(10.55)	(5.58)
GDP_FC_{t+1}	-0.0008***	-0.0001
	(-3.47)	(-0.67)
N	10,198	6665
Adj. R^2	0.5141	0.0384

Panel B: Firm-level Characteristics Including Change in VA		
	Profit (PI > 0)	**Loss (PI <= 0)**
	$TI_{i,t+1}$	$TI_{i,t+1}$
α_0	-0.0212***	0.0047
	(-2.69)	(0.59)
$PTI_{i,t}$	0.7108***	0.1259***
	(26.81)	(3.24)
$BTDs_{i,t}$	-0.4621***	-0.1286***
	(-10.90)	(-3.12)
$DEBT_{i,t}$	-0.0043	-0.0029
	(-0.66)	(-0.76)
$\Delta VAA_{i,t}$	0.0449	-0.0534***
	(0.70)	(-2.72)
$CAPEX_{i,t}$	-0.0434**	0.0235
	(-2.18)	(1.18)
$FORSALE_{i,t}$	-0.0171***	-0.0006
	(-3.77)	(-0.18)
$MERGER_{i,t}$	-0.0060**	0.0007
	(-2.29)	(0.27)
$TLCF_{i,t}$	-0.0121	-0.0003
	(-1.60)	(-0.64)
$INTANG_{i,t}$	0.0140**	0.0035
	(2.43)	(0.49)
$MININT_{i,t}$	-0.0377	0.0712
	(-0.07)	(0.15)
$EQ\_INC_{i,t}$	-0.1629	0.0547
	(-0.66)	(0.56)
$TI_{i,t-3}$	0.1896***	0.1318***
	(6.23)	(2.70)
GDP_FC_{t+1}	0.0017**	0.0000
	(3.27)	(0.06)
N	3,079	766
Adj. R^2	0.5926	0.0868

This table reports results from regressing future taxable income on current financial statement income, book-tax differences, and various firm-characteristics. Results are reported separately for profit and loss firm-year observations. Profit observations are those with pre-tax financial statement income greater than zero, while loss observations are those with pre-tax financial statement income equal to or less than zero. We obtain confidential taxable income data from SOI's corporate return files. Financial reporting data is obtained from Compustat. $TI_{i,t+k}$ is a firm's taxable income for up to three years ahead (i.e., k=1, k=2, and k=3), scaled by beginning financial statement assets. $PTI_{i,t}$ is a firm's pre-tax book income in year t (PI), scaled by beginning financial statement assets (AT). $BTDs_{i,t}$ are a firm's total BTDs, measured as pre-tax income (PI) less the sum of current federal and foreign tax expense (TXFED + TXFO) divided by the statutory tax rate. BTDs are scaled by beginning total assets. $DEBT_{i,t}$ is a firm's total long-term debt (DLTT), scaled by beginning total assets. $\Delta VAA_{i,t}$ is the change in a firm's deferred tax valuation allowance, scaled by beginning total assets. C$APEX_{i,t}$ is capital expenditures (CAPEX) scaled by beginning total assets. $FORSALE_{i,t}$ is a firm's foreign sales, equal to total sales reported in the Compustat segments file minus total domestic sales, scaled by beginning total assets. $MERGER_{i,t}$ is an indicator variable equal to one if a firm experiences a merger or acquisition in year t (positive Compustat AQP or AQC) and zero otherwise. $TLCF_{i,t}$ is a firm's tax loss carryforwards as reported on their 10-K (TLCF) scaled by beginning total assets. $INTANG_{i,t}$ is a firm's intangible assets (INTAN) scaled by beginning total assets. $MININT_{i,t}$ is a firm's reported minority interest income (MII) scaled by beginning total assets. $EQ\_INC_{i,t}$ is equal to income reported under the equity method (ESUB) scaled by beginning total assets. We include taxable income in year t-3 (TI_{t-3}) as a forecasting parameter because it is the most recent taxable income figure available to users of SOI microdata at the time financial statements are released. GDP_FC_{t+1} is the one-year ahead GDP forecast published by CBO in its Budget and Economic Outlook in January following the end of a firm's fiscal year. All continuous, firm-level variables are winsorized at the 1st and 99th percentile. In parentheses, we report Newey and West (1987) heteroskedasticity and autocorrelation consistent t-statistics with four lags. Statistical significance at the 1, 5, and 10 percent levels are indicated by ***, **, and *, respectively.