Accounting Measurement of Assets and Earnings and the Market Valuation of Firm Assets [1]

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Abstract

We empirically examine the association between market valuations of firm assets and the amount of information about firms' asset productivity provided by the accounting measurements of assets and earnings. We quantify this information by the R-squared from a firm-specific regression of future earnings on past assets. We document statistically and economically significant positive relations between the R-squared and both the marginal and average values of firm assets. The relations are robust to a variety of variables controlling for both profitability and the underlying volatility of firms' operations, to alternative estimation methods, and to the inclusion of alternative measures of accounting quality (e.g., accrual quality, earnings persistence). We interpret these findings as consistent with the ideas that the mapping between accounting measurement of assets and earnings provides information about the underlying productivity of firm assets, and this information is reflected in investors' valuation of firm assets.

1 Introduction

We empirically examine the association between market valuations of firm assets and the amount of information about firms' asset productivity provided by the accounting measurements of assets and earnings. A link between information about asset productivity (hereafter, productivity information) and investors' valuation of firm assets is predicted by standard neoclassic investment models under uncertainty (e.g., Hayashi (1982), Abel (1983), Dixit and Pindyck (1993)). In these models, the productivity of a firm's capital stock is an unknown parameter to agents making decisions that affect firm values. Holding the expected level of productivity constant, the more productivity information agents have, the more efficient are their decisions, and the higher are expected values for firm assets (Blackwell (1953)). The decisions that affect firm values are made by firm insiders (e.g., managers and boards of directors) and outsiders (e.g., creditors, suppliers, and customers). For example, creditors who know more about the borrower's productivity are more willing to offer lower borrowing costs, which would in turn increase firm value. Anticipating these effects, shareholders would value assets higher when there is more information about the assets' productivity. Since accounting reports are the primary source of public information about a firm's capital stock (input) and economic income (output), it follows that investors would value firm assets higher when accounting reports reveal more information about asset productivity.

We conjecture and provide evidence for the hypothesis that the accounting measurements of assets and of earnings jointly provide useful information about firms' asset productivity, and that such information is reflected in the stock price. The hypothesis recognizes that accounting rules and principles are designed to provide informative measurement not only about firms' economic incomes (by accounting earnings), but also about the underlying economic assets that generate the incomes (by accounting assets). Specifically, because accounting records and measures firms' operating, investing, and financing decisions, how accounting measurements quantify both these decisions (via assets and liabilities) and their resulting economic incomes (via accounting earnings) can affect the amount of information about the productivity/efficiency of these decisions, which in turn affects firm values.

To illustrate the main idea, consider two hypothetical firms, A and B, operating in the same industry. They take otherwise identical actions except that firm A develops intangible assets in-house and firm B buys them from outside. Assume for the moment that the intangibles employed at both firms are of the same underlying productivity, either purchased or self-developed (so that future incomes would be the same for both firms), except that no one knows the true productivity. A natural way to infer asset productivity is to associate the output from the assets with the value of the assets (i.e., calculate the return on assets). When accounting rules dictate different measurements for these two firms' assets and earnings, their accounting reports can provide different amount of information for users to learn about the productivity. We conjecture that investors would value higher the assets at the firm whose accounting reports provide more information about the underlying productivity.[1]

We posit that agents obtain productivity information from firms' financial reports by analyzing the relation between accounting assets and accounting earnings. We propose a measure for the amount of such information based on the R-squared (R^2) from a firm-specific linear regression of operating earnings on one-year lagged net accounting operating assets over the 10-year period preceding the year of valuation. The slope coefficient on accounting assets can be interpreted as an estimate for the average return on firm assets, a commonly used proxy for productivity and a key performance metric, and the R^2 measures the amount of productivity information revealed from firms' accounting measurements of past assets and their corresponding future earnings.[2]

We employ two estimation methods to examine the main hypothesis. The first follows the approach used in the finance literature to estimate the marginal value of cash by regressing excess stock returns on changes in cash and noncash assets, liabilities, and equity items (Faulkender and Wang (2006)).[3] The change specification allows the coefficient on assets to be interpretable as the estimated marginal value of assets. Assuming no agency conflicts or financial constraints, the theoretical marginal value of cash should be 1. Thus, the comparison between the coefficient estimate on cash assets and 1 can be used to gauge whether the estimation is properly specified. In this specification, our hypothesis predicts that the coefficient on assets is an increasing function of the R^2, that is, more information about asset productivity from accounting measurements of assets and earnings increases the marginal value of firm assets. In the second approach, we regress a measure of Tobin's Q on the R^2 and a set of control variables including firm- and year-fixed effects. The coefficient for the R^2 therefore estimates the effect of information from accounting reports on the average value of firm assets and is predicted to be positive under the main hypothesis.

[1] We have no priors on which firm's accounting measurement provides more productivity information.

[2] Undoubtedly, other elements of financial reports provide useful information as well, for example, managements' qualitative discussions about performance (e.g., Li (2008)). We view the R^2 as a lower bound for such information, and an intuitive empirical proxy to capture the underlying construct. The key is the R^2 captures the amount of productivity information from the mapping between inputs (balance sheets) and outputs (income statements).

[3] It is similar to a change version of the standard accounting valuation equation of regressing price on book values of equity and accounting earnings (Easton and Harris (1991) and Ohlson (1995)). The difference is that instead of expressing the changes in equity into earnings level, it expands changes in equity into changes in assets and liabilities.

Using a large sample of U.S. firms from 1960-2010, we document a significant positive relation between the R^2 measure and the market valuation of firm assets, consistent with the hypothesis that the productivity information from the association between accounting assets and earnings is reflected in investors' valuation of firm assets. The effect of R^2 on asset values is significant not only statistically but also economically: the estimate suggests that an inter-quartile increase of R^2 is associated with a 33% increase (from \$0.31 to \$0.41) in the marginal value of the average firm's noncash assets, whereas a one-standard deviation of R^2 is associated with about 7% change in the average value of firm assets. The results are robust to alternative estimation methods (e.g., portfolio approach and Fama-MacBeth).

Analytically, the R^2 can be expressed as the product of two components. One component measures the maximum amount of information that investors can learn about asset productivity from firms' past history of economic incomes and assets, assuming the measurement system perfectly measures true economic incomes and assets. The maximum amount of information firms' history can provide is likely determined by business fundamentals, including business models, competitive and operating environments, and macroeconomic conditions, that is, factors unrelated to the accounting measurement system. The second component is a scale factor capturing the proportion of the maximum information from past history that investors can obtain from *accounting measurements of assets and earnings*, holding constant business fundamentals. The main hypothesis is premised on the idea that accounting reports are the primary source of quantified measures of firms' assets and incomes, and therefore provide the primary source of productivity information for investors. As such, it does not distinguish between these two components, and treats two firms with the same R^2s as equal regardless of whether each of two components is identical between the two firms.

We perform several analyses to gauge the extent to which the relation between the R^2 and firm value is driven by differences in business fundamentals or differences in accounting measurement quality. First, we decompose the R^2 into an industry-specific component and a firm-specific component and examine how each component relates to firm value. The idea is that the industry component is more likely to reflect business fundamentals that are outside firms' control, whereas the firm-specific component is more likely to capture accounting measurement quality at the firm level. We observe significant cross-industry variations in the industry-specific R^2, although the firm-specific R^2 explains a majority (90%) of variations in the R^2 value. Both components affect market value positively, with the effects relatively stronger for the firm-specific R^2. This is especially notable in the average value specification, where the effect of the R^2 is obtained after including firm-fixed effects that control for time-invariant unobservable firm-specific effects.

We also control for various time-varying firm-specific aspects of business fundamentals, including the level of performance and different measures of volatility (e.g., volatilities in sales and stock returns). Consistent with intuition, asset values are higher for firms with higher levels of ROA and lower values of volatility. However, the coefficient estimate on the R^2 changes little with or without these controls, suggesting that cross-firm differences in accounting measurement quality (the second component of the R^2) can be a significant driver for the relation between market value of assets and the R^2. These results indicate that investors assess higher value to a firm's assets when more uncertainty about the firm's asset productivity can be resolved from its accounting reports, holding constant the firm's underlying productivity and volatility.

We provide evidence supporting two implicit assumptions underlying the hypothesized link between market value of assets and the information about asset productivity. The first is that the productivity information affects asset values only to the extent the assets are expected to remain within the firms so that actions can be taken to increase the expected cash flows generated by these assets. We find that the positive relation between market value of assets and the R^2 is driven by the subsample with positive profitability and is not present in the subsample with negative profitability. These findings are consistent with the prediction that the link between asset value and productivity information is weakened when assets are more likely to be disposed (e.g., Hayn (1995)). The second implicit assumption is that past productivity is informative about firms' future productivity, more so for firms with higher values of the R^2 measure. Consistent with this idea, we find that holding constant the level of current profitability, firms with high R^2s are more likely to maintain similar levels of profitability in the future (up to 5 years) than firms with low R^2s.

We perform a battery of tests to check the robustness of our findings. The first is to see whether the R^2 captures the same information content as other measures of accounting earnings quality examined in prior literature (e.g., Francis et al. (2004)). Most of these earnings quality measures focus on how informative accounting earnings are about the true economic incomes, taking the true economic incomes as given. In contrast, the R^2 measure quantifies the amount of information about firms' underlying productivity, a construct that cannot be directly measured by any accounting measurement item alone. To examine whether R^2 is *empirically* different than other measures, we include in the main regressions the set of accounting earnings attributes/qualities used in the literature, including accrual quality, earnings persistence, earnings smoothness, earnings predictability, value relevance, timeliness, and conservatism. We do not find any of these alternative measures to be statistically related to the marginal value of firm assets, and only earnings predictability and smoothness are positively related to the average value of assets. More importantly, the coefficient estimates for R^2 remain significant with the magnitudes little changed regardless of which alternative measure is included. We interpret these findings as consistent with the idea that the R^2 is an empirically distinct measure than these measures of earnings quality.

We also examine the sensitivity of our results to alternative specifications of the R^2 regression. First we obtain the R^2 from regressing cash flows from operations on accounting assets. The idea is to examine whether there is informational difference from using accrual accounting for both assets and earnings versus using accruals for assets only. We find that the cash flows-based R^2 positively and significantly affects the market valuation of assets when included on its own, but the significance disappears when the earnings-based R^2 is included. In contrast, the significance and magnitude of the earnings-based R^2 are little changed regardless of whether the cash flows-based R^2 is included. When we partition the sample by the accrual quality measure (Dechow and Dichev (2002)), we find that the cash flows-based R^2 is positive and statistically significant only in the high accrual quality subsample and not in the low accrual quality subsample, whereas the earnings-based R^2 remains significant in both subsamples. These results raise questions about whether the accrual quality measure is measuring the quality of accrual or the quality of cash flows.

We obtain the R^2 from regressing earnings on just the beginning of period assets. The idea is both to be parsimonious and to follow economic theories which show that the beginning of period capital stock is a state variable that captures all necessary information from past history of capital stocks. To gauge how sensitive our results are to alternative specifications, we obtain alternative R^2 measures from regressing earnings on lagged assets and lagged earnings, and from regressing on just lagged earnings alone. We find that when included on their own, these alternative R^2s are positively correlated to the market values. However, their effects either disappear or noticeably weaken when the "simple" R^2 is included, suggesting that the R^2 appears to do a reasonably good job in capturing the amount of productivity information conveyed by accounting reports.

Our paper contributes to the broad accounting literature on assessing the source and market valuation consequences of accounting information.[4] Much of the prior literature focuses on earnings quality in terms of how informative accounting earnings are about firms' true economic income and examines the valuation consequences of earnings quality (e.g., Francis et al. (2004, 2005), Core et al. (2006), Ogneva (2012)). Our analyses differ in both the type of information and the channel through which such information affects firm values. Instead of focusing on how informative accounting earnings

[4] Lev (1989), Kothari (2001), and Dechow, Ge, and Schrand (2010) provide reviews of research in the past decades.

are about economic incomes, we are interested in how accounting measurements of assets and earnings jointly provide information about the productivity of assets that generate economic incomes. Instead of focusing on costs of capital effects (i.e., the denominator effect, which implicitly takes the levels of future economic incomes as exogenously given), we assess the effect on the market valuation of firm assets, allowing a numerator effect in that accounting information improves the decision efficiency which in turn increases the expected level of future economic income.

Our paper also contributes to the debate about the role of accounting reports in providing valuable information to capital markets (e.g., Lev (1989), Francis and Schipper (1999), Collins, Maydew, and Weiss (1997)). Our results support the view that the value of accounting reports does not have to come from providing news to investors (e.g., earnings announcements) or from capturing other information that also affects stock price. They provide empirical support for the long-held belief that the value of accounting reports comes from assisting investors to better understand the efficiency of firm decisions and the productivity of firm assets, which can in turn help investors better evaluate the implications of firm decisions and predict future earnings.

Our method to evaluate the information quality of accounting reports provides an alternative approach to address issues of interest to regulators and standard setters. Prior literature often assesses the value of accounting constructs by their associations with stock price/return, implicitly assuming that stock prices contain valuation information that is not in financial reports. Our approach does not rely on this assumption. Instead, it takes the perspective that the association between market valuation of firm assets and accounting assets is a function of the amount of productivity information jointly provided by accounting assets and earnings. Prior literature also assesses earnings' quality by how well earnings measure true economic incomes, *taking economic incomes as given.* Our analysis views economic asset and its associated productivity as the key driver for firm values. As such, our approach evaluates the quality of accounting information by how accounting assets and earnings jointly provide users with productivity information that is relevant for generating future economic incomes. To the extent that our approach explicitly considers the measurement of assets, it is consistent with the FASB's framework to focus on the measurements of balance sheet items.

Our paper is related to prior research on fundamental analysis (e.g., Ou and Penman (1989), Lev and Thiagarajian (1993), Abarbarnell and Bushee (1997, 1998)). Unlike our study, fundamental analysis focuses on how stock price does or does not incorporate value-relevant accounting information and therefore does not address how much information from accounting reports *is* actually incorporated in price.[5] The approach adopted in the paper is related to the approach in Lev and Sougiannis (1996), who use the connection between R&D expenditures and future earnings to establish the value of R&D assets and assess to what extent stock price embeds this value. We focus on the valuation of productivity information, not the valuation of the economic assets generated by R&D activities.

Lastly, our study is related to research on how balance sheets act as constraints on firms' earnings management practices (Barton and Simko (2002), Baber et al. (2011)). These studies focus on the discretionary component of earnings over a short period time, whereas we focus on the entire earnings sequence over 10 years. Our main interest is on the value consequences of the productivity information from the mapping between accounting earnings and assets. As such, we are agnostic about whether and how such information is affected by earnings management.

2 Hypothesis development and empirical measure

2.1 Hypothesis development

To see how information about asset productivity can increase firm value, consider a simple setting where a firm's operation in each period t is summarized by choosing economic assets (K_t) to maximize expected future economic income (x_{t+1}):

$$\max_{K_t} E\left(x_{t+1}\right) = E_t\left(\theta\right) K_t - C\left(K_t\right). \tag{1}$$

That is, each period's economic income (x_{t+1}) is generated by the firm's economic assets (K_t) via a production function $E_t\left(\theta\right) K_t - C\left(K_t\right)$. $E_t\left(\theta\right) K_t$ measures the gross output from all economic assets, and $C\left(K_t\right)$ measures the costs of generating these assets with $C' > 0$ and $C'' > 0$. The costs arise from management's operating, investing, and financing decisions that firms take to achieve specific levels of assets. The expectation is taken with respect to θ which measures the productivity of assets (i.e., θ can be viewed as the theoretical counterpart for the empirical return on assets).

When θ is unknown, more information about θ can increase expected future economic incomes by facilitating better decision-making, which in turn increases firm value (Blackwell (1953)).[6] This information can improve the efficiency of decisions made by firm insiders (e.g., managers and boards of directors) as well as decisions made by firm outsiders that affect firm value. For example, information about θ can improve managers' ability to select value-maximizing investment projects and to adjust

[5] Abarbarnell and Bernard (1992, 2000) are the few exceptions.

[6] Mathematically, as long as the objective function is concave, there is a positive value to more information about θ.

investments optimally by investing (divesting) when the expected θ is high (low). Similarly, when creditors know more about borrowers' asset productivity, they are more confident about firms' operations and are more likely to extend credit on more favorable terms, which reduces firms' financing costs and increases share values. The value of information can also come from providing stewardship relevant information that can reduce the costs of information asymmetries between firm insiders and outsiders, as well as among outside investors (see, e.g., Bushman and Smith (2001)). As long as such information is public, investors would recognize the benefits of such information and value firms higher accordingly in anticipation of the benefits of such information.[7]

We focus on the value of information about asset productivity provided by financial statements. While accounting reports do not directly measure asset productivity, we hypothesize that how well accounting assets and earnings measure their economic counterparts affects the amount of information one can learn about productivity, and that the value of such information is reflected in stock price. Our hypothesis rests on the fact that accounting assets (and liabilities) recognize and measure the operating, investment, and financing decisions firms take that create economic assets. At the same time, accounting earnings are designed to capture the outcomes of these decisions (i.e., firms' true economic incomes) via various revenue and expense recognition rules and principles. Therefore, how accurately accounting numbers measure and quantify these decisions (via assets) and their resulting economic incomes (via accounting earnings) can contain useful information about the efficiency of these decisions, which in turn means the relation between accounting assets and accounting earnings can provide information about the productivity of economic assets.

To illustrate the intuition, consider the example in the introduction with two otherwise identical firms, A and B. They have the same production functions (e.g., as described by equation (1)), and differ only in terms of their accounting measurements of economic assets and incomes. Suppose firm A's accounting is perfect in that its accounting earnings (e_t) and accounting assets (A_{t-1}) always accurately measure their respective counterparts (x_t and K_{t-1}) in every period. This provides investors

[7] The idea that the amount of productivity information revealed by firms' external accounting reports can affect real decisions has been analyzed in the accounting analytical literature (e.g., Kanodia and Lee (1998) and Kanodia, Singh, and Spero (2005)). In these papers, value-relevant decisions are made by firm insiders before the accounting reports are issued. Nonetheless, the amount of information outside investors obtain from accounting reports affects these decisions by affecting investors' assessment of the value consequences of these decisions.

an opportunity to learn about θ from a linear projection of x_t on K_{t-1} (or equivalently, e_t on A_{t-1}):[8]

$$x_t = \alpha_0 + \theta K_{t-1} + \varepsilon_{xt}.$$

Here ε_{xt} can be thought of as representing exogenous shocks, including, for example, the type and nature of operating/competitive environments, and macro-economic conditions. The (maximum) amount of information investors can learn from the knowledge of past history of x_t and K_{t-1} is quantified as the R-squared from regressing x_t on K_{t-1}, given by

$$R^2_{true} = 1 - \frac{Var(\varepsilon_{xt})}{Var(x_t)}, \tag{2}$$

where $Var(.)$ stands for the variance of a random variable.

In contrast, suppose firm B's accounting reports provide noisy measurements of its economic assets and economic incomes. Under standard measurement error assumptions, one can show that the R-squared from regressing firm B's earnings on past assets (R^2_B) would be proportional to R^2_{true} as in

$$R^2_B = \Delta_B R^2_{true}, \tag{3}$$

where $\Delta_B \leq 1$ measures the proportion of maximum productivity information (R^2_{true}) that can be conveyed by accounting measurements of assets and earnings.[9] As a result, investors learn less about B's productivity from its accounting assets and earnings about θ. To the extent that the R-squared is a reasonable proxy for the amount of productivity information from accounting reports, the preceding discussion predicts that investors would assign a higher valuation to firm A's assets.

We summarize the above discussion as our main hypothesis, stated below in alternative form:

H1: The market valuation of a firm's assets is higher when the firm's accounting measurement of assets and earnings reveal more information about the underlying productivity of firm assets.

[8] It is a standard assumption in dynamic asset pricing literature that agents learn about firm fundamentals from past history. See Ai (2010) for a recent example. Hansen and Sargent (2007) provide a rigorous discussion on the rationale and implication of linear learning.

[9] Assuming the measurement errors in assets and in earnings are uncorrelated (that is, any correlation between earnings and assets is due to true productivity), it is straightforward to show that $\Delta = R_{e,x}R_{A,K}$ where $R_{e,x} \leq 1$ measures the proportion of variation in accounting earnings (e) caused by variation in economic income (x), and $R_{A,K} \leq 1$ measures the proportion of variation in accounting assets (A) caused in variation in economic assets (K).

2.2 Empirical measure of productivity information from accounting reports

We quantify the amount of productivity information from accounting measurements of assets and earnings by the R-squared of the following firm-specific regression:

$$NOPAT_{it} = a_{0i} + a_{1i} \cdot NOA_{it-1} + \epsilon_{it} \tag{4}$$

where $NOPAT_{it}$ is the net operating earnings after tax ($NOPAT$) for firm i during year t, calculated as the after-tax amount of operating earnings (i.e., earnings excluding financing charges), and NOA_{it-1} is the net operating assets for firm i at the beginning of year t, calculated as the sum of shareholders' equity and interest-bearing debt, minus cash assets (i.e., cash and marketable securities). For each firm-year, we estimate equation (4) over the preceding 10 years of observations for this firm using both $NOPAT_{it}$ and NOA_{it-1} in dollar terms unscaled. Thus, the slope coefficient $\widehat{a_{1i}}$ provides an estimate of a firm's average accounting return on assets in the past 10 years, a standard measure of firm performance that investors use to gauge productivity.

Equation (4) is a parsimonious specification to produce a scaled sample correlation between firms' past assets and future earnings. A priori it is unclear which measures of accounting earnings or accounting assets investors use to learn about asset productivity. We use operating income and operating assets based on the understanding that they are commonly used in security analysis to capture information about the average productivity of core operations (e.g., Penman (2012)). Equation (4) does not suggest that all economic incomes from firm assets are realized in the next year, or that different types of assets have the same productivity. We discuss and examine the sensitivity of our results to alternative specifications in Section 5.

As expressions (2) and (3) indicate, the empirical R^2 can differ cross-sectionally either because firms have different fundamentals (i.e., different R^2_{true}), or because they have different accounting measurement quality/noise (i.e., different Δ). The main hypothesis predicts a positive relation between market value of assets and the amount of information investors can obtain from accounting measurements of assets and earnings. It does not distinguish whether the amount of information comes from R^2_{true} or Δ. It is also agnostic about the source of the variation in either R^2_{true} or Δ.[10] While we provide preliminary empirical evidence on the relation between R^2 and measures of business fundamentals

[10] In the earlier example, firm A and firm B can have different Δs because the accounting rules for internally developed intangibles provide different amount of information about asset productivities than the accounting rules for purchased intangibles. If both firms have internally developed intangibles, their Δs can differ to the extent the implementation of the rules differs between firms.

that can affect R^2_{true}, our primary focus is to examine whether the productivity information from accounting measurements of assets and earnings as quantified by the R^2 measure is reflected in firm value. To the extent that it is, it would be interesting for future research to explore the cross-sectional determinants of the amount of such information and their implications for accounting measurements.

We perform several analyses of the extent to which the cross-sectional relation between firm asset values and R^2 is driven by differences in fundamentals, or by differences in accounting measurement quality. First, we decompose R^2 into an industry-specific component and a firm-specific component and include both components in the regressions. The main hypothesis predicts both components to be related to firm values, although it is an empirical question which component has a larger economic impact. Second, we control for firm-specific fundamentals, by including measures of profitability and volatility. Lastly, in the average value estimation, we include firm-fixed effects to control for unobservable, time-invariant firm-specific effects.

To the extent differences in industry-specific R^2 are mainly driven by differences in fundamentals, a positive relation between market value and the industry-specific R^2 indicates that investors value firms higher when they learn more information about firm productivity from firms' past history of economic incomes and assets. This interpretation emphasizes the value of information from past history and does not directly speak to the value of accounting measurements. That said, since the R^2 is calculated based on accounting reports, a positive relation supports the view that accounting measurements contain valuable productivity information that is reflected in firm value. To the extent the control variables capture differences in firm fundamentals, a positive relation between market value and R^2 (especially the firm-specific component of R^2) suggests firm values are higher when their accounting measurements of assets and earnings jointly provide more productivity information, holding the fundamentals constant.

3 Sample and summary description

We begin our analysis by estimating equation (4) for all non-financial (SIC code: 6000-6999) and non-utility (SIC code: 4900-4999) firms in Compustat from 1960 to 2010. Equation (4) is estimated for each firm i in year t using data in the preceding ten years (i.e., $t-9$ to t). We require at least five observations in each estimation to obtain a meaningful estimate of R^2. By design, this R^2 is firm-year specific and is indexed throughout the paper by subscripts i and t. The final sample for the main analysis of market valuation consists of 85,652 firm-year observations from 1970 to 2010.

Table 1, Panel A provides summary statistics for the estimated R^2 and $\widehat{a_1}$ (i.e., the estimate for return on assets, ROA) for each of the 48 industries in Fama and French (1997). It shows that the R^2 exhibits both significant cross-industry and within-industry variation. The tobacco products industry has the highest average (median) R^2 at 57.0% (64.5%), followed by alcohol (beer and liquor) with an industry average (median) at 55.5% (63.3%). Coal mining has the lowest average (median) R^2 at 24.2% (16.1%), preceded by steel products (average at 28.6% and median at 19.6%). Interestingly, these are also the industries with the respective highest and lowest within-industry standard deviations, with 35.4% for the tobacco industry and 24.2% for the coal industry. Other consumer industries also exhibit high R^2s, including, for example, the retail and restaurant industries. In contrast, industrial product industries such as the shipping and defense industries tend to have low R^2s. To the extent industrial product industries are more cyclical than consumer industries, these patterns are consistent with the interpretation that the amount of productivity information one can learn from past history is affected by business models and operating environments.

Table 1, Panel A also lists the average estimate of ROA for each industry. The precious metals industry has the lowest average ROA at -7%, followed by fabricated products (e.g., metal forging and stamping) at -3.4%. By contrast, the tobacco industry leads with the highest ROA of 16.1%, followed by the soft drink industry at 11.5%. These results show that while ROA and R^2 are correlated (by design), they have different information content. Whereas ROA provides the estimated mean of return on assets, R^2 estimates the amount of productivity information provided by the mapping between accounting assets and earnings.

Table 1, Panel B presents the summary statistics for all the main variables used in the analysis. The sample average R^2 is 37.9% with a standard deviation of 31.6%. To isolate the effect of industry membership, we calculate a firm-specific R-squared (R^2_{Firm}) defined as the difference between R^2_{it} and the median of R^2 for all firms in the same Fama-French 48-industry in that year (denoted as $R^2_{Industry}$). By construction, the average $R^2_{Industry}$ is close to the average R^2 whereas the average R^2_{Firm} is relatively small (the median is close to 0). However, the cross-sectional variations of R^2 are mostly driven by firm-specific R^2_{Firm} and not their industry component: the standard deviation for R^2_{Firm} is more than twice of that for $R^2_{Industry}$ (30.7% vs. 14.1%).

Table 2 presents the correlation between the three R^2 measures and measures of business fundamentals. We focus on measures of volatility and profitability, as expression (2) indicates that these are the fundamentals that affect R^2_{true}. Specifically, we consider the following as firms' fundamentals: firm size ($Size$, measured in logarithm of total assets), profitability (measured ROA, i.e., the estimated $\widehat{a_1}$

coefficient from (4)),[11] earnings persistence ($Persistence$, estimated as the AR(1) coefficient from a firm-specific time-series autoregression of earnings per share in the rolling window of 10 years preceding year t), sales volatility ($Std(Sales)$, defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t), ROA volatility ($Std(ROA)$, defined as the standard deviation of the ratio of operating earnings to assets in the rolling window of 10 years preceding year t), the stock return's correlation with the market ($Beta$, estimated as the CAPM beta using monthly returns in the rolling window of 10 years preceding year t) and idiosyncratic return volatility ($Sigma$, defined as the standard deviation of CAPM model residuals).

Panel A of Table 2 presents the univariate correlations. Consistent with the observation that cross-sectional variation in the unadjusted R^2 is mostly driven by firm-specific R^2_{Firm}, the correlation between these two measures is 0.9. In contrast, the Pearson (Spearman) correlation between R^2 and $R^2_{Industry}$ is 0.27 (0.25). All three R^2 measures are positively correlated with measures of firm fundamentals in predicted ways. For example, they are positively correlated with firm size (except $R^2_{industry}$) and ROA, and negatively correlated with various measures of volatility. Lastly, Table 2 shows that both R^2 and R^2_{Firm} are positively significantly related to the measure of average asset value (Q, Tobin's Q, defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets), consistent with our basic hypothesis. We will formally test and examine this in the next section.

Panel B of Table 2 presents results from a multiple regression of R^2 and R^2_{Firm} on firm fundamentals. We find that the relation between R^2 and these characteristics remain qualitatively the same (in significance level and in sign) as in univariate correlations, with and without including firm-specific fixed effects. However, the explanatory power of the regression is much higher (larger than 40%) with firm-fixed effects than without (at about 8% to 11%), suggesting that a large portion of the variation in R^2 is driven by unobserved firm-specific effects. To the extent that the accounting practices and measurements at the firm level are relatively stable over time (conditional on changes in fundamentals), this is consistent with the interpretation that *cross-sectional* variations in the R^2 measure (especially R^2_{Firm}) are driven by differences in firms' accounting measurement quality (i.e., the Δ component in (3)).

[11] Results are qualitatively unchanged if we measure ROA with the over time average of $NOPAT/NOA$.

4 Main results

The main hypothesis predicts a positive relation between the market value of firms' assets and the information provided by the accounting measurements of firms' assets and earnings (R^2_{it}). We test this hypothesis using two specifications: the first examines the effect of R^2 on the marginal value of firm assets and the second examines the effect on the average value of firm assets.

4.1 Effect on marginal value of assets

4.1.1 Empirical specification

For the marginal value specification, we estimate the following equation

$$R_{i,t} - R^b_{i,t} = \alpha_t + \beta_0 \Delta NA_{it} + \beta_1 R^2_{it} \cdot \Delta NA_{it} + \lambda_0 \Delta Cash_{it} + \lambda_1 R^2_{it} \cdot \Delta Cash_{it} + Control_{it} + \varepsilon_{it}. \quad (5)$$

where the dependent variable $R_{i,t} - R^b_{i,t}$ is the compounded size and book-to-market adjusted realized returns (Fama and French (1993)) during fiscal year t, ΔNA_{it} ($\Delta Cash_{it}$) is the change in firm i's non-cash (cash) assets during year t, α_t is the year-fixed effect, and $Control_{it}$ is a set of control variables, all scaled by the market value at the beginning of year t. The main hypothesis predicts $\widehat{\beta}_1 > 0$.

As discussed in Faulkender and Wang (2006), equation (5) is specified from an identity that expresses the market valuation of assets as a multiple of the replacement costs of firm assets. It allows the value of assets to depend on the type and nature of assets (e.g., cash vs. noncash assets) by decomposing a firm's assets into different categories, including cash and non-cash assets, liabilities, and book value of equity. Because equation (5) regresses changes in firm values on changes in assets, the coefficient estimates on assets can be interpreted as the marginal value of firm assets. Faulkender and Wang (2006) find that the marginal value of cash is close to \$1 for the average U.S. firm, consistent with the theoretical prediction. For our purpose, we separate cash from noncash assets both to facilitate comparison with the estimates reported in Faulkender and Wang (2006) to gauge how reasonable our results are, and more importantly, to account for the differences between cash and noncash assets in terms of their liquidity, firm-specificity (how unique assets are to firm-specific operations), and accounting measurement attributes.[12]

We include the same set of control variables as those in Faulkender and Wang (2006), including year fixed effects (α_t); ΔE_{it}, the change in earnings before extraordinary items in year t; ΔRD_{it}, the change in research and development expense in year t; ΔInt_{it}, the change in interest expense

[12] We follow Faulkender and Wang (2006) and define cash assets as the sum of cash and marketable securities.

in year t; ΔDiv_{it}, the change in common dividends paid in year t, and $Leverage_{i,t-1}$, the market leverage at the end of year $t-1$ defined as total debt divided by the sum of total debt and the market value of equity. Faulkender and Wang (2006) include interactive terms of $Cash_{it-1} \cdot \Delta Cash_{it}$ and $Leverage_{it-1} \cdot \Delta Cash_{it}$ to control for the effects of cash balance and leverage on the marginal value of cash. Following the same logic, we include $NA_{it-1} \cdot \Delta NA_{it}$ and $Leverage_{it-1} \cdot \Delta NA_{it}$ where NA_{it-1} is the logarithm of net assets in year t-1. In addition, where R^2_{it}, $Cash_{it-1}$, NA_{it-1} and $Leverage_{it-1}$ are included to ensure that their interactive terms with changes in assets are not capturing the main effects. Expression (6) summarizes these control variables:

$$\begin{aligned} Control_{it} = \{ & \alpha_t, NA_{it-1} \cdot \Delta NA_{it}, Leverage_{it-1} \cdot \Delta NA_{it}, Cash_{it-1} \cdot \Delta Cash_{it}, \\ & Leverage_{it-1} \cdot \Delta Cash_{it}, R^2_{it}, NA_{it-1}, Cash_{it-1}, Leverage_{it-1}, \\ & \Delta E_{it}, \Delta RD_{it}, \Delta Int_{it}, \Delta Div_{it}, NF_{it}\} \end{aligned} \quad (6)$$

To facilitate interpretation, for all interactive control variables, we use the demeaned values when they are interacted with either ΔNA_{it} or $\Delta Cash_{it}$, where the demeaned values are calculated as the difference between the variables and their sample averages. This way, the coefficient estimate $\widehat{\lambda}_0$ is directly interpretable as the market valuation of cash assets for an average firm with all characteristics at sample average values. $\widehat{\beta}_0$ is the estimated marginal value of noncash assets for a hypothetical firm with average characteristics but whose accounting assets and earnings provide no information (i.e., $R^2 = 0$) about its asset productivity, whereas $\widehat{\beta}_0 + \widehat{\beta}_1$ estimate the marginal value of noncash assets for a firm with average characteristics whose accounting assets and earnings perfectly reveal its asset productivity ($R^2 = 1$). Throughout the paper, all standard errors are two-way clustered by both firm and year (Petersen (2009)).

4.1.2 Main effects on marginal value of assets

Table 3, Panel A presents the results for estimating equation (5) with control variables specified by (6). Column (1) shows that the coefficient estimate for ΔNA is 0.296, suggesting that an additional dollar of noncash assets is valued at 29.6 cents by equity investors for a firm with $R^2 = 0$. The coefficient on $R^2 \cdot \Delta NA$ is 0.175 and is statistically significant at less than the 1% level, consistent with the main hypothesis that investors value firm assets higher when accounting measurements of assets and earnings reveal more productivity information. The economic magnitude is significant: an inter-quartile increase of R^2 of 57.3% (from 8.2% at the twenty-five percentile to 65.5% at the seventy-five percentile value of R^2, see Table 1, Panel B) would increase the marginal value of noncash assets by more than 10 cents (=0.175*57.3%), more than a 25% increase relative to the marginal value of assets for a firm with sample median value of R^2 (at 39 cents, calculated as 0.296*1.31; the sample median for R^2 is 0.31).

Columns (2) to (4) decompose R^2 into R^2_{Firm} and $R^2_{industry}$ and estimate equation (5) with each of the components on its own as well as together. The idea is to assess whether the positive effect of R^2 on firm value is from industry-specific variations in R^2 (i.e., $R^2_{industry}$) or firm-specific variations (i.e., R^2_{firm}). The results show that the effect is driven by both components. The coefficient estimates for $R^2_{firm} \cdot \Delta NA$ and for $R^2_{industry} \cdot \Delta NA$ are both positive and statistically significant at less than the 1% level, when included on their own and when included together. The economic magnitudes of the estimates are both meaningful. In Column (4), $\widehat{\beta}_1 \left(R^2_{industry} \right) = 0.203$ suggests that everything else equal, a one-standard deviation increase in an industry's average R-squared $R^2_{industry}$ (about 14.1%) would increase the marginal value of assets for this industry by 2.8 cents, about 10% higher than the baseline value of 28.6 cents (i.e., the coefficient estimate for ΔNA_{it}). Similarly, $\widehat{\beta}_1 \left(R^2_{firm} \right) = 0.155$ suggests that a one-standard deviation increase in a firm-specific R^2_{firm} (about 0.307) would increase the firm's marginal value of assets by 4.8 cents, higher than the effect of $R^2_{industry}$.

The coefficient estimates for the control variables are similar to those reported in Faulkender and Wang (2006). For example, the coefficient estimate on $\Delta Cash$ in Column (1) indicates that the marginal value of cash for our sample firm is 99 cents per dollar.[13] This estimate is similar to that reported in Faulkender and Wang (2006) and is not statistically different from $1 at conventional levels, consistent with the theoretically predicted value of 1. The coefficient on $Cash_{t-1} \cdot \Delta Cash$ is negative, suggesting diminishing marginal value of cash when a firm's cash position improves. The coefficient on $Leverage \cdot \Delta Cash$ is negative, consistent with the idea that as the leverage ratio becomes higher, some value of cash will accrue to debt holders. Similar decreasing marginal returns are also observed for noncash assets, as the coefficient estimates for $NA_{it-1} \cdot \Delta NA_{it}$ and for $Leverage_{i,t-1} \cdot \Delta NA_{it}$ are significantly negative at less than the 1% level.

4.1.3 Controlling for firm fundamentals

To further control for the effect of business fundamentals, Table 3, Panel B adds additional variables and their interactive terms with ΔNA_{it} to the baseline specification. As suggested by equation (2), we focus on control variables that capture cross-sectional differences in firm productivity and volatil-

[13] It is calculated as 0.927+0.162*0.378 where 0.927 is the coefficient estimate for $\Delta Cash$, 0.162 is the coefficient estimate for $R^2 * \Delta Cash$, and 0.379 is the sample average of the R^2.

ity. As such, we include firm performance as measured by return on assets (ROA), sales volatility ($Std(Sales)$), ROA volatility ($Std(ROA)$), earnings persistence ($Persistence$), CAPM Beta ($Beta$) and idiosyncratic return volatility ($Sigma$) as controls for firm fundamentals.

Panel B shows that throughout all columns, the coefficients on $R^2 \cdot \Delta NA$ remain positive and statistically significant. While the coefficient estimates are on average smaller than those reported in Panel A, the differences are small in magnitude. For example, the coefficient estimate for R^2 in Column (1) of Panel A is 0.175, compared with 0.173 in Column (1) of Panel B.

Panel B shows that the coefficients on $ROA \cdot \Delta NA$ are positive and statistically significant throughout, suggesting that investors assign higher marginal values to assets in firms with higher return on assets. The inclusion of ROA does not affect the significance of $\widehat{\beta}_1$, consistent with the idea that the R^2 captures the amount of information about asset productivity, not the level of productivity itself. The coefficient on $Std(Sales) \cdot \Delta NA$ is negative in all columns, suggesting that assets are valued lower for firms with volatile sales. The volatility in ROA has no significant impact on the marginal value of assets, as the coefficient on $Std(ROA) \cdot \Delta NA$ is insignificant in all models. In summary, we conclude that findings in Table 3 are consistent with the hypothesis that investors value assets higher when firms' accounting measurement of assets and earnings provide more information about asset productivity, and this relation holds after controlling for business fundamentals.

4.1.4 Robustness to alternative estimation methods

We also assess the sensitivity of the marginal value results to two alternative estimation methods. Due to space constraints, we do not tabulate the results and report the main findings in text.[14] We first re-estimate the specification in Panel B using the Fama-MacBeth (1973) method. The time-series averages of coefficient estimates and t-statistics from the 41 annual regression results (untabulated) are similar in magnitude to those reported in Panel B. For example, the coefficient estimate for $R^2 \cdot \Delta NA$ is 0.186 (t-statistic = 5.84). When we decompose R^2 into R^2_{Firm} and $R^2_{Industry}$, and include both $R^2_{Firm} \cdot \Delta NA$ and $R^2_{Industry} \cdot \Delta NA$ in the regressions, the estimates are 0.137 and 0.377, respectively and both statistically significant at less than the 1% level. The coefficients on other control variables and business fundamental variables are also similar to those reported in Table 3, Panel B.

To guard against the possibility that our results in Table 3 are driven by extreme values of the R^2 measures, we sort firm-year observations by R^2 into four quartiles and re-estimate equation (5) for each quartile without the interaction term between R^2 and ΔNA. The coefficient on ΔNA increases

[14] The tabulated results are available from the authors upon request.

monotonically from the lowest R^2 quartile (0.296) to the highest R^2 quartile (0.444), consistent with the interpretation that the marginal value of firm assets increases as accounting measurements of assets and earnings provide more information about firms' asset productivity.

4.2 Effect on average value of assets

We examine the relation between the average value of firm assets and the R^2 by a cross-sectional regression of a measure of Tobin's Q (for the average value for firm assets) on R^2 and control variables. We adopt two estimation specifications. The first estimates the following panel regression:

$$Q_{it} = \alpha_t + \alpha_i + \beta_1 R^2_{it} + \gamma X_{it} + \varepsilon_{it}, \tag{7}$$

where Q_{it} is a measure of Tobin's Q for firm i in year t, defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets, α_t and α_i are year- and firm-fixed effects, and X_{it} is the vector of control variables.

The results are presented in Panel A of Table 4. Columns (1) to (4) include only the year- and firm-fixed effects as control variables. They show that the coefficient estimates for R^2_{it}, R^2_{firm}, and $R^2_{industry}$ are all positive and statistically significant (at less than the 1% level), consistent with the hypothesis that higher R^2 is associated with higher average value of firm assets. The economic magnitude of the coefficients are meaningful too. Relative to the sample average Tobin's Q (at 1.603, see Table 1, Panel B), a one-standard deviation increase in R^2_{it} (0.316) is associated with a 7% (= $0.316 \cdot 0.356/1.603$) increase in the average market value of assets. Similar magnitudes are observed for the effects of R^2_{firm} and $R^2_{industry}$. Across all four columns, the adjusted R-squared of the regression is above 57%, suggesting that the fixed effects alone are reasonable controls for the unobserved firm-specific fundamentals.

Columns (5) to (8) of Panel A add the control variables to the regression. The inclusion of these time-varying firm-characteristics in general decreases the magnitudes of the coefficient estimates for R^2s, although changes are relatively small and the estimates for all R^2 measures remain highly statistically significant. For example, the coefficient for R^2 in Column (5) is 0.319 (t-statistic = 13.6), lower than that shown in Column (1) (0.356, t-statistic = 15.3). Including the control variables only marginally increases the adjusted R-squared of the regression. In untabulated results, we follow the specification used in Himmelberg et al. (1999) and add additional control variables including sales (and its squared term), capital expenditures, R&D, and advertising, profit margin, leverage, and PPE level (and its squared term). We find that the coefficient estimates for various R^2_{it} measures remain significantly positive and are on average about the same magnitudes as those shown in Panel A.

In our second specification, we follow the approach in Pastor and Veronesi (2003) by regressing Tobin's Q on R_i^2 with each firm's future stock returns and profitability as the main control variables. This specification is based on Vuolteenaho (2000) who derives an approximate linear identity that equates the logarithm of a firm's market to book ratio with an infinite discounted sum of future log returns and log profitability. Pastor and Veronesi (2003) modify the approximate linear identity by adding additional controls for firms' dividend policies and financial leverage. The estimation is done each year cross-sectionally. The over-time averages of the annual regression coefficients are reported, with the t-statistic calculated per the method in Fama and MacBeth (1973).

Because our dependent variable is Tobin's Q (as opposed to market-to-book ratio), we modify the specification in Pastor and Veronesi (2003) and use ROA instead of ROE as the measure of profitability. Results from this specification are reported in Panel B. The coefficient estimates for all three R^2 measures are highly positive and significant at less than the 1% level, consistent with the hypothesis that everything else equal, investors value firm assets higher when the accounting measurements of assets and earnings provide more information about firms' underlying productivity.

Expression (3) shows that the empirical R^2 is a product of firm fundamental (R^2_{true}) and accounting measurement quality (Δ). To better separate the two effects, in both specifications we also regress the logarithm of the dependent variable on the logarithm of R^2 which can be expressed as $\ln\left(R^2\right) = \ln\left(R^2_{true}\right) + \ln\left(\Delta\right)$. The results (untabulated) show that the coefficient estimates for $\ln\left(R^2\right)$ remain highly positive, and are robust to the inclusion of various control variables for firm fundamentals. To the extent that the control variables explain the variations in $\ln\left(R^2_{true}\right)$, the finding that $\ln\left(R^2\right)$ remains significant is consistent with the interpretation that a large portion of the cross-sectional valuation effect of R^2 is driven by cross-firm differences in accounting measurement quality.

4.3 Additional analyses of the main hypothesis

In this subsection, we evaluate two assumptions underlying the main hypothesis. The first assumption is that the information about asset productivity affects the marginal asset values to the extent that the assets stay with the firms so that agents can take actions upon such information to increase the expected cash flows that these assets generate. As firms are likely to dispose/abandon assets when they are found to be unproductive, the link between asset value and information about asset productivity is weakened (e.g., Hayn (1995), Li (2013)). We examine this empirically by estimating equations (5) separately on the subsamples partitioned by the sign of the estimated coefficient from the R-squared regression. To the extent profitable firms are less likely to abandon/dispose assets, we expect the positive relation between assets' marginal values and R^2 to be stronger in profitable firms than in loss firms.

Table 5, Panel A shows the results from the marginal value estimation. The coefficient estimate for $R^2 \cdot \Delta NA$ is positive (at 0.204) and significant (t-statistic =5.99) only in the subsample with positive ROA, and is negative at -0.020 and insignificantly different from zero (t-statistic = -0.46) in the subsample with negative ROA. These results are obtained after controlling for business fundamentals, including the level of ROA and volatilities (coefficients for these controls are suppressed for space constraints). The estimation results also indicate that consistent with intuition, the marginal value of assets is higher for the average profitable firms than for the average loss firms. To see that, note that the average R^2 is 0.456 in the positive ROA subsample, higher than that in the negative ROA subsample (at 0.248) (results not tabulated). Therefore, the coefficient estimates for ΔNA (0.316 in Column (1) for the positive ROA subsample and 0.314 in Column (5) for the negative ROA subsample) imply that the marginal value of assets for the average profit firms is 0.409 (=0.316+0.204*0.456) and is only 0.295 (=0.314-0.02*0.248) for the average loss firms.

In untabulated analyses, we also estimate (7) separately on these subsamples and find qualitatively similar results: the coefficient on R^2 is positive and statistically significant at less than the 1% level only in the positive ROA subsample. Overall, we interpret these results as consistent with the idea that the productivity information from accounting measurement of assets and earnings are more likely to be reflected in firm values when assets are less likely to be abandoned.

The second implicit assumption underlying the main hypothesis is that the productivity information revealed from past accounting reports is informative about firms' future productivity. If R^2 measures the amount of information about firms' future productivity, then past productivity information should have higher predictive power for future productivity in firms with higher R^2. In other words, higher R^2 means that the past profitability level is more likely to be repeated in the future.

To empirically validate this assumption, we perform a retention rate analysis. Specifically, for each year t, we first independently sort firms into quartiles based on $R^2(R^2_{Firm})$ and their realized return on assets (ROA) ratio. For each R^2 quartile, we then calculate the percentage of firms remaining in the same ROA quartile in years $t+1$, $t+2$ and $t+5$ (i.e., the retention rate). We repeat the same calculation each year and present the average retention rate in Table 5, Panel B. The left panel sorts firms by the R^2 and the right panel sorts by the firm specific R^2_{Firm}. Since the results are qualitatively similar, we discuss those with the R^2 only.

Overall, the results show that conditional on the realized ROA levels, the retention rates are higher among the subsamples with higher R^2. For example, the 1-year retention rate for firms with lowest R^2 staying in the lowest ROA quartile is 56.5%, indicating that on average, among 56.5% of the firms with lowest R^2 and lowest ROA stay in the lowest ROA quartile next year. More importantly, the retention rate increases monotonically as we move down the same ROA column to higher R^2 quartiles. In particular, 83.3% of the firms with the highest R^2 remain in the lowest ROA quartile next year. Similar results are observed for other ROA quartiles, consistent with our hypothesis that past productivity information is more informative about future productivity in firms with high R^2. The 2-year (5-year) retention rates are generally lower than the 1-year retention rate, consistent with the idea that forecast accuracy deteriorates as the forecasting horizon lengthens. Regardless, higher R^2 subsamples on average have higher retention rates across all ROA levels.

5 Robustness and sensitivity analyses

5.1 Controlling for other earnings quality measures

In this subsection, we first discuss the conceptual difference between the R^2 measure and other existing measures of earnings quality used in the literature. We then provide empirical evidence that the R^2 measure captures different information content than the existing measures. We focus on the seven earnings attributes examined in Francis et al. (2004): accrual quality, persistence, predictability, earnings smoothness, relevance, timeliness, and conservatism. All earnings quality measures are calculated similar to those in Francis et al. (2004) and are defined such that higher values represent desirable earnings attributes.

Conceptually, R^2 differs from these measures in the following ways. First, while both the R^2 measure and other measures view accounting earnings as an informative but potentially noisy signal of true economic incomes, the R^2 measure emphasizes the economic process of generating earnings by considering the relation between earnings (as an output) and assets (as an input). In contrast, other measures focus on earnings attributes, without considering the economic inputs (assets) that generate the earnings. Since the true economic incomes are not observable, these measures are empirically constructed by comparing accounting earnings with various proxies for true economic incomes such as cash flows, stock returns, or past earnings, taking the level of true economic incomes as exogenous.

Second, the R^2 is a measure of the *amount* of information in information theories (see Cover and Thomas (1991), Veldkamp (2011)). It is indicative of, but not synonymous with, the *quality* of accounting information. For example, while more conservative accounting systems may be of higher quality, they do not necessarily provide more information. The same applies to other measures of accounting quality used in the literature (e.g., accrual quality, earnings persistence) which are not direct measures for the amount of information. As expression (3) indicates, a direct measure for the amount of information can help delineate the effect of accounting measurement quality (the Δ component in (3)) from that of firms' business fundamentals (the R^2_{true} component in (3)).

Lastly, the theoretical channel underlying the relation between R^2 and firm asset value is more clearly defined. To see this, consider a two-period model where the price for risky asset i at date t (P_t^i) can be expressed as

$$P_t^i = \frac{E\left(x_{t+1}^i\right)}{R_f} + Cov\left(m_{t+1}, x_{t+1}^i\right) \tag{8}$$

where R_f is the risk-free rate, m_{t+1} is the stochastic discount factor (risk factor), and x_{t+1}^i is the payoff from the security (see, e.g., Cochrane (2005)). In a large economy, information specific about security i does not affect the economy wide risk-free rate R_f or the stochastic discount factor m_{t+1}.[15]

In this framework, firm-specific information affects P_t^i by affecting either expected level of future economic incomes $E\left(x_{t+1}^i\right)$ (i.e., the numerator) or by affecting the correlation between firm-specific cash flow and systematic risk factors (i.e., $Cov\left(m_{t+1}, x_{t+1}^i\right)$, the denominator). Most existing literature examines the cost of capital effect of these earnings quality measures, implicitly taking the level of future economic income as given and focusing on the denominator. The pricing equation can be expressed in return forms as $E\left(R^i\right) - R_f = -R^f Cov\left(m, R^i\right)$. This implies that if one is interested in testing the effect of information from the denominator channel, a proper specification is to regress each stock's factor loadings (correlations between stock returns and systematic risk factors) on proxies for information quality (see Lambert et al. (2007), Hughes et al. (2007)). In this specification, the pricing effect of information comes from the uncertainty with respect to the true economic incomes x_{t+1}, holding constant the expected level of x_{t+1}. The more informative accounting earnings is about economic income, the smaller the correlation, and the higher the price (and the closer the security is to a risk-free bond).

In contrast, the R^2 measures the information about asset productivity. Its link to stock price can come from the expected cash flow term ($E\left(x_{t+1}^i\right)$) in that more information helps better decision making which in turn increases expected future cash flows as explained in Section 2. It can also come from the denominator channel, in that more information about productivity implies more information

[15] Specifically, m depends on the expected marginal rate of intertemporal consumption substitution at the macro level (see Cochrane (2005)), and $R_f = 1/E\left(m\right)$.

about future incomes (conditional on existing economic assets), which lowers the correlation between firms' income and systematic risk factors.

Despite their conceptual differences, it is unclear whether *empirically* the R^2 measure captures different information content than other accounting measures. We examine this issue by adding the seven earnings quality measures to our main regressions and present results in Table 6. Panel A of Table 6 presents the correlation among various measures. We notice that the R^2 measure is positively related to four accounting-based measures (accrual quality, persistence, predictability, and smoothness) with the Pearson correlation coefficient ranging from 0.17 to 0.22. The correlation between R^2 and the three market-based attributes (relevance, timeliness, and conservatism) is on average weaker. It is positively correlated with relevance at 0.08 and negatively correlated with timeliness (at -0.04). The correlation with conservatism is almost zero (at 0.01).

Table 6, Panel B presents the results from including the seven earnings quality measures (EQs) in the marginal value estimation. Columns (1) to (7) add earnings quality measures one at a time and Column (8) adds all measures in one regression. Throughout all specifications, the coefficient estimates for $R^2 \cdot \Delta NA$ remain statistically significant with little change in magnitudes regardless of which earnings quality measure is included. In contrast, the coefficients on $EQ \cdot \Delta NA$ are either negative or statistically insignificant. Similar results (untabulated) are observed when we estimates the relation between the average value of assets and various measures of accounting information. Specifically, we find that the coefficient estimate for R^2 stays around 0.3 (similar to those reported in Table 4) regardless of which other earnings quality measure is included. In contrast, the coefficient estimates for all other earnings quality measures (except the predictability and the smoothness measures) are either significantly negative or insignificantly different from zero.

Taken together, these results indicate that R^2 captures a unique aspect of information conveyed by accounting measurements of asset and earnings and its effect on asset valuation is not subsumed by other earnings quality measures.

5.2 Alternative specifications for R2

We obtain the R^2 from the firm-specific regression of earnings on lagged assets. The rationale is to obtain the sample correlation between firm assets and earnings using a parsimonious specification as guided by theory. In this section, we assess the robustness of this specification.

5.2.1 Cash flows versus accounting earnings

A defining feature of accounting measurements of both assets and earnings is the use of accruals. Accruals play an important role in linking changes in net asset values to earnings. We conjecture that the use of accruals improves the ability of accounting measurements of assets and earnings to provide productivity information. As such, the R^2 measure obtained from accrual-based assets and earnings should be more informative than a cash flows-based R^2. To examine this conjecture, we obtain a cash flows-based R-squared (R^2_{CFO}) from estimating equation (4) except that we replace the dependent variable with cash from operations in year t.

Column (1) of Panel A, Table 7 shows that when included on its own, the coefficient estimate for $R^2_{CFO} \cdot \Delta NA$ is 0.068 and significant at less than the 5% level. However, Column (2) shows that the estimated magnitude decreases to only 0.011 when the original R^2 is included in the regression, and is no longer significant at conventional levels (t-statistic = 0.43). These results suggest that while the mapping between accounting assets and cash provides information about asset productivity, its effect is subsumed by the information from the mapping from accounting assets and earnings.

To further assess whether accruals drive the differences in information between cash flows-based R^2 and earnings-based R^2, Columns (3) to (6) repeat the exercise in Columns (1) and (2) on the subsamples partitioned by whether a firm's accrual quality measure (as defined in Dechow and Dichev (2002)) is above or below the sample median. They show that the coefficient estimate for $R^2 \cdot \Delta NA$ remains quantitatively similar in both subsamples. However, the coefficient estimate for $R^2_{CFO} \cdot \Delta NA$ is significant both on its own and in the presence of $R^2 \cdot \Delta NA$ only in the high accrual quality subsample, and is not significant in the low accrual quality subsample. Since the earnings-based R^2 significantly affects firm values regardless of the measure of accrual quality, these results call into question whether the accrual quality measure is a measure for the quality of cash flows or for the quality of accruals.

5.2.2 Mapping earnings with past earnings or past assets

The R^2 regression (i.e., equation (4)) can be viewed as mimicking both the underlying production process as specified by economic theory and the way users of financial statements analyze financial reports. It is also consistent with economic theories which show that the beginning period capital stock is a state variable that contains all necessary information at the time of decision. However, it only regresses one-period ahead earnings on past assets and therefore may fail to capture productivity information for firms with longer operating cycle (i.e., the period t in expression (1) is longer than one year). As such, we explore two alternative (peusdo-) R^2s to see if they may do a better job in measuring the amount of information about asset productivity.

The first alternative is the R-squared from estimating (4) but replacing NOA_{t-1} with $NOPAT_{t-1}$.[16] We refer to the R-squared from this regression as S_1^2. Since capital stock changes over time by the amount of net investments each period, it is highly positively serially correlated. To the extent that lagged economic income is a function of capital stock two periods ago, it is also correlated with lagged capital stock. As such, the R^2 from this regression is similar to that from regressing earnings on assets from two years ago, and therefore may do a better job capturing the productivity information for firms with longer operating cycles. The difference with (4) is that the coefficient estimate on $NOPAT_{t-1}$ can no longer be directly interpreted as average return on assets, rather it is closer to the notion of earnings persistence used in the accounting literature. The second alternative, referred to as S_2^2, is the R-squared from estimating (4) but adding $NOPAT_{t-1}$ (i.e., the lagged value of the dependent variable) as the second regressor. Per the discussion above, because the two regressors are highly correlated, the regression exhibits significant multicollinearity, rendering the R-squared difficult to interpret. As such, a priori, we do not expect it to be a more robust measure of information than the original R^2.

Panel B of Table 7 presents the results from using these alternative R-squared measures. The correlation coefficient between S_1^2 and our original R^2 is 0.71 and that between S_2^2 and R^2 is 0.81 (untabulated). Columns (1) and (2) show that when S_1^2 is included on its own, the coefficient estimate for $S_1^2 \cdot \Delta NA$ is 0.202 (t-statistic = 6.23). The magnitude decreases to 0.129 (t-statistic = 4.42) when the original R^2 is included. The coefficient estimate for $R^2 \cdot \Delta NA$ is lower than in the absence of $S_1^2 \cdot \Delta NA$ but remains significantly positive at 0.114 (t-statistic = 4.31). In untabulated tests, we obtain similar results when we calculate S_1^2 as the R-squared from regression earnings on assets two period ago. These results are consistent with the interpretation that the R^2 and S_1^2 both capture productivity information, perhaps differently for firms with different operating cycles.

Columns (3) and (4) perform similar analyses using S_2^2. They show that while the coefficient estimate for $S_2^2 \cdot \Delta NA$ is positive and significant on its own, its magnitude drops significantly when $R^2 \cdot \Delta NA$ is included and is no longer statistically significant at conventional levels (t-statistic = 1.18). These results suggest that the original R^2 is a robust measure of the amount of information about asset productivity from accounting reports. It performs better than S_2^2, which is expected as the multicollinearity between the regressors renders S_2^2 less meaningful. It performs equally well as

[16] It is similar to the predictability measure used in the literature but estimated using earnings in dollar amounts unscaled.

S_1^2 empirically, consistent with the interpretation that it is a lower bound measure of the information from firms' financial reports about firms' future productivity.

6 Conclusion

In this paper, we empirically evaluate the relation between the market valuation of firm assets and the amount of productivity information provided by the mapping between accounting measurements of assets and earnings. Our main hypothesis rests on the fact that accounting assets are meant to quantify decisions with probable future benefits, and accounting earnings are meant to quantify these benefits when they materialize. Thus, how well accounting assets map into future earnings provides information about the productivity of firm assets. We quantify the amount of such information by the R-squared (the R^2) from a firm-specific regression of operating earnings on beginning of the period operating assets. We find that both the marginal and the average market valuations of firm assets are higher for firms with higher R^2s. The relation is robust to controls for firm fundamentals, to alternative estimation methods, to alternative earnings quality measures, and to alternative specifications of the mapping between earnings and assets. Overall, our results contribute to the literature by highlighting and quantifying a different type of information provided by financial reports (i.e., information about firms' decision efficiency/asset productivity, not just about the output of these decisions in the form of accounting earnings).

Our results point to several areas for future research. Our analyses suggest that a significant portion of cross-sectional variations in the R^2 measure may depend on how accounting measurement rules capture firms' fundamentals, holding the fundamentals constant. Future research can examine how different accounting rules and measurements affect the amount of productivity information from accounting reports. For example, in the example discussed in the introduction, it would be interesting to assess whether different rules regarding intangible assets indeed provide differing amount of information for asset productivity. Relatedly, to the extent that managerial discretion plays a significant role in financial reports, future research can also explore how earnings management affects the amount of productivity information from financial reports. It would also be interesting to explore who uses the productivity information in what decisions, as well as how the value of productivity information varies cross-sectionally by firm characteristics.

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Table 1: Summary Statistics

This table reports the mean, median, and standard deviation for the R^2 measure and *ROA* for each Fama and French (1997) 48-industry. For each firm-year, we estimate a regression of net operating earnings after tax (*NOPAT*) in year *t* on net operating assets (*NOA*) in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. R^2 is the adjusted R-squared from this regression and *ROA* is the coefficient estimate on *NOPAT*. Industries are sorted in descending order by the average value of R^2.

Panel A: Summary statistics for R^2 by industry

Fama-French Industry	R^2			*ROA*			Average number of firms per year
	Mean	Median	Std Dev	Mean	Median	Std Dev	
Tobacco Products	0.570	0.645	0.354	0.161	0.121	0.267	5
Beer	0.555	0.633	0.343	0.092	0.097	0.138	12
Retails	0.460	0.435	0.339	0.056	0.064	0.203	142
Healthcare	0.458	0.426	0.353	0.059	0.070	0.231	28
Communication	0.454	0.411	0.337	0.058	0.057	0.233	59
Shipping Containers	0.452	0.450	0.322	0.049	0.070	0.148	11
Books	0.451	0.418	0.332	0.055	0.072	0.204	28
Restaurants and Hotels	0.441	0.402	0.351	0.040	0.053	0.178	44
Soda	0.439	0.413	0.315	0.115	0.065	0.271	7
Drugs	0.431	0.388	0.331	0.015	0.074	0.525	91
Food	0.430	0.389	0.332	0.065	0.075	0.179	59
Personal Services	0.428	0.381	0.333	0.057	0.049	0.218	20
Chemicals	0.418	0.387	0.319	0.059	0.066	0.227	59
Medical Equipment	0.418	0.375	0.327	0.058	0.074	0.344	60
Household	0.414	0.375	0.319	0.048	0.061	0.211	59
Transportation	0.385	0.321	0.314	0.045	0.045	0.180	69
Entertainment	0.383	0.325	0.314	0.039	0.043	0.196	28
Wholesale	0.382	0.299	0.325	0.041	0.047	0.166	96
Electrical Products	0.381	0.319	0.310	0.025	0.050	0.227	37
Business Supplies	0.378	0.310	0.311	0.044	0.054	0.167	51
Business Services	0.372	0.304	0.312	0.009	0.036	0.327	172
Rubber and Plastic Products	0.360	0.294	0.304	0.029	0.042	0.223	31
Measuring and Control Equipment	0.358	0.286	0.299	0.006	0.030	0.298	61
Energy	0.355	0.274	0.305	0.046	0.053	0.219	102
Clothes	0.354	0.285	0.299	0.032	0.039	0.215	48
Aircraft	0.352	0.261	0.315	0.046	0.050	0.167	22
Computers	0.349	0.266	0.302	-0.011	0.024	0.333	78
Building Materials	0.346	0.282	0.294	0.031	0.046	0.206	80
Automobiles	0.343	0.248	0.298	0.031	0.042	0.192	51
Construction	0.341	0.248	0.310	0.032	0.035	0.208	25
Agriculture	0.334	0.231	0.305	0.032	0.034	0.237	9
Machinery	0.329	0.254	0.291	0.019	0.032	0.233	109
Miscellaneous	0.328	0.261	0.284	-0.004	0.025	0.248	37
Electrical Equipment	0.326	0.238	0.296	-0.014	0.005	0.286	144
Toys	0.323	0.259	0.279	-0.020	0.006	0.215	22
Defense	0.323	0.238	0.291	0.026	0.021	0.194	6
Precious Metal	0.317	0.232	0.281	-0.070	-0.038	0.246	12
Textiles	0.309	0.233	0.275	0.017	0.028	0.166	26
Nonmetallic Mines	0.306	0.235	0.270	0.053	0.046	0.229	16
Fabricated Products	0.305	0.204	0.295	-0.034	-0.002	0.249	13
Ships	0.291	0.174	0.290	-0.008	0.004	0.265	7
Steel	0.286	0.196	0.271	0.015	0.022	0.194	51
Coal	0.242	0.161	0.242	0.025	0.033	0.319	4

Panel B: Summary statistics for main variables

This table reports the summary statistics for the main variables used in this paper. R_i-$R_{i,t}^b$ is the excess stock return, where $r_{i,t}$ is the annual stock return of firm *i* at year *t* (fiscal year-end) and $R_{i,t}^b$ is stock *i*'s benchmark portfolio return at year *t*, calculated as the return of the 5X5 Fama and French (1993) portfolios formed on size and book-to-market portfolio to which stock *i* belongs at the beginning of fiscal year *t*. R^2 is the adjusted R-squared from a regression of net operating earnings after tax (*NOPAT*) in year *t* on net operating assets (*NOA*) in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. $R^2_{Industry}$ is the median R^2 for each Fama-French 48 industry in each year. R^2_{Firm} is the difference between R^2 and the corresponding $R^2_{Industry}$. *Log*(*Total Assets*) is the logarithm of total assets. *ROA* is the estimated coefficient on *NOPAT* in Equation (1). Δ*NA* is change in net assets where net assets are defined as total assets minus cash holdings. Δ*Cash* is change in *Cash*, defined as the balance of cash and marketable securities from year *t*-1. Δ*E* is change in earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. NA_{t-1} is the logarithm of net assets in year *t*-1. *Leverage* is the market leverage ratio defined as total debt over the sum of total debt and the market value of equity. ΔInterest is change in interest expense. Δ*Div* is change in common dividends paid. *NF* is the total equity issuance minus repurchases plus debt issuance minus debt redemption. Δ*RD* is change in R&D expenditures. *Tobin's Q* is defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets.

Variable	N	Mean	Std Dev	P5	P25	Median	P75	P95
R_i-R_b	85,652	0.020	0.505	-0.606	-0.276	-0.051	0.205	0.892
R^2	85,652	0.379	0.316	0.003	0.082	0.309	0.655	0.933
R^2_{Firm}	85,652	0.055	0.307	-0.378	-0.185	0.001	0.289	0.602
$R^2_{Industry}$	85,652	0.325	0.141	0.149	0.225	0.293	0.388	0.607
Log(*Total Assets*)	85,652	5.567	2.014	2.554	4.064	5.387	6.906	9.234
ROA	85,652	0.030	0.260	-0.382	-0.058	0.046	0.136	0.373
Persistence	85,652	0.349	0.417	-0.326	0.077	0.352	0.604	1.050
Std(*Sales*)	85,652	0.228	0.172	0.052	0.112	0.181	0.289	0.575
Std(*ROA*)	85,652	0.060	0.067	0.010	0.021	0.038	0.071	0.190
Beta	85,652	1.143	0.545	0.331	0.781	1.096	1.445	2.100
Sigma	85,652	0.125	0.055	0.059	0.084	0.113	0.153	0.230
ΔNA_t	85,652	0.096	0.408	-0.439	-0.022	0.059	0.196	0.733
$\Delta Cash_t$	85,652	0.017	0.131	-0.155	-0.024	0.003	0.044	0.229
ΔE_t	85,652	0.018	0.179	-0.210	-0.024	0.010	0.048	0.259
NA_{t-1}	85,652	5.305	2.076	2.154	3.780	5.122	6.692	9.066
$Cash_{t-1}$	85,652	0.167	0.212	0.007	0.037	0.094	0.211	0.587
$Leverage_t$	85,652	0.252	0.227	0.000	0.052	0.201	0.402	0.700
ΔRD_t	85,652	0.002	0.016	-0.014	0.000	0.000	0.002	0.024
$\Delta Interest_t$	85,652	0.003	0.026	-0.027	-0.002	0.000	0.006	0.040
ΔDiv_t	85,652	0.001	0.011	-0.008	0.000	0.000	0.002	0.014
NF_t	85,652	0.011	0.081	-0.063	-0.003	0.000	0.006	0.134
Tobin's Q	85,652	1.603	1.132	0.741	0.979	1.249	1.783	3.645

Table 2: Correlation among R^2 and Firm Characteristics

Panel A: Sample correlations

Panel A reports the sample correlation for variables used in the main test. Pearson correlations are presented in the upper-right corner and Spearman correlations are presented in the lower-left corner, respectively. R^2 is the adjusted R-squared from a regression of net operating earnings after tax (*NOPAT*) in year *t* on net operating assets (*NOA*) in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. $R^2_{Industry}$ is the median R^2 for each Fama-French 48-industry in each year and R^2_{Firm} is the difference between R^2 and its corresponding $R^2_{Industry}$. *Tobin's Q* is defined as the sum of market value of equity, liquidation value of preferred equity and book value of total liabilities scaled by total assets. *Log*(*Total Assets*) is the logarithm of total assets. *ROA* is the estimated coefficient on *NOPAT* in Equation (1). *Persistence* is defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the 10-year rolling window preceding year *t*. *Std*(*Sales*) is defined as the standard deviation of sales scaled by total assets in the rolling window of 10 years preceding year t. *Std*(*ROA*) is defined as the standard deviation of realized return on assets in the rolling window of 10 years preceding year *t*. *Beta* is estimated using monthly return data in the 10-year rolling window preceding year *t*. *Sigma* is the standard deviation of CAPM model residual in the 10-year rolling window preceding year *t*. Correlations in bold are statistically significant at the 5% level or lower.

Variable	R^2	R^2_{Firm}	$R^2_{Industry}$	*Size*	*ROA*	*Persistence*	*Std*(*Sales*)	*Std*(*ROA*)	*Beta*	*Sigma*	*Tobin's Q*
R^2	1	**0.90**	**0.27**	**0.15**	**0.21**	**0.18**	**-0.08**	**-0.16**	-0.00	**-0.15**	**0.15**
R^2_{Firm}	**0.90**	1	**-0.17**	**0.18**	**0.16**	**0.14**	**-0.07**	**-0.09**	-0.00	**-0.11**	**0.17**
$R^2_{Industry}$	**0.25**	**-0.15**	1	**-0.05**	**0.12**	**0.10**	**-0.03**	**-0.17**	-0.00	**-0.10**	**-0.03**
Size	**0.15**	**0.18**	**-0.07**	1	**0.16**	**0.02**	**-0.23**	**-0.26**	**0.01**	**-0.34**	**0.01**
ROA	**0.40**	**0.34**	**0.18**	**0.20**	1	**0.07**	**-0.06**	**-0.24**	**-0.03**	**-0.17**	**0.13**
Persistence	**0.18**	**0.15**	**0.09**	**0.03**	**0.11**	1	**0.01**	**-0.06**	0.00	**-0.08**	**-0.01**
Std(*Sales*)	**-0.11**	**-0.09**	**-0.04**	**-0.29**	**-0.11**	0.00	1	**0.24**	**0.04**	**0.18**	**-0.01**
Std(*ROA*)	**-0.30**	**-0.20**	**-0.25**	**-0.31**	**-0.34**	**-0.10**	**0.35**	1	**0.14**	**0.40**	**0.32**
Beta	**0.01**	0.01	**0.01**	**0.03**	-0.00	**0.01**	**0.05**	**0.10**	1	**0.21**	**0.08**
Sigma	**-0.16**	**-0.13**	**-0.07**	**-0.38**	**-0.21**	**-0.09**	**0.24**	**0.46**	**0.18**	1	**0.14**
Tobin's Q	**0.20**	**0.23**	**-0.06**	**0.16**	**0.24**	**-0.01**	**-0.05**	**0.17**	**0.06**	**0.14**	1

Panel B: Regressions of R^2 and R^2_{Firm} on firm fundamental variables

Panel B reports the results from regressing R^2 and R^2_{Firm} on firm characteristics. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(4)	(5)
	R^2	R^2_{Firm}	R^2	R^2_{Firm}
Log(*Total assets*)	0.019***	0.016***	0.063***	0.061***
	(10.88)	(9.72)	(13.05)	(12.34)
ROA	0.180***	0.145***	0.168***	0.143***
	(7.56)	(6.97)	(9.87)	(9.31)
Persistence	0.116***	0.106***	0.087***	0.079***
	(14.04)	(15.48)	(14.36)	(13.85)
Std(*Sales*)	-0.058***	-0.052***	-0.0244	-0.025
	(-3.34)	(-3.14)	(-1.18)	(-1.22)
Std(*ROA*)	-0.109**	-0.116**	-0.601***	-0.512***
	(-2.04)	(-2.38)	(-6.91)	(-6.27)
Beta	0.007***	0.008***	0.004***	0.002*
	(3.05)	(4.49)	(3.35)	(1.77)
Sigma	-0.313***	-0.295***	-0.156***	-0.145***
	(-7.46)	(-7.45)	(-6.97)	(-6.60)
Firm Fixed Effects	No	No	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
N	85,652	85,652	85,652	85,652
adj. R-sq	0.111	0.083	0.436	0.403

Table 3: Effect of R^2 on Marginal Value of Assets

Panel A reports results from an OLS regression of annual excess stock returns on R^2 (R^2_{Firm} and $R^2_{Industry}$) plus firm characteristics (Equation (5)). R_i -$R_{i,t}^b$ is the excess stock return, where $R_{i,t}$ is the annual stock return of firm *i* at year *t* (fiscal year-end) and $R_{i,t}^b$ is stock *i*'s benchmark portfolio return at year *t*, calculated as the return of the 5X5 Fama and French (1993) portfolios formed on size and book-to-market portfolio to which stock *i* belongs at the beginning of fiscal year *t*. R^2 is the adjusted R-squared from a regression of net operating earnings after tax (*NOPAT*) in year *t* on net operating assets (*NOA*) in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. $R^2_{Industry}$ is the median R^2 for each Fama-French 48-industry in each year and R^2_{Firm} is the difference between R^2 and its corresponding $R^2_{Industry}$. $\Delta Cash$ is change in cash. $Cash_{t-1}$ is the cash balance from last year. ΔE is change in earnings before extraordinary items plus interest and deferred taxes. ΔNA is change in net assets where net assets are defined as total assets minus cash holdings. ΔInterest is change in interest expense. ΔDiv is change in common dividends paid. *Leverage* is the market leverage ratio defined as total debt over the sum of total debt and the market value of equity. *NF* is the total equity issuance minus repurchases plus debt issuance minus debt redemption. ΔRD is change in R&D expenditures. All independent variables except *Leverage* and R^2 (R^2_{Firm} and $R^2_{Industry}$) are deflated by the lagged market value of equity. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

Panel A: Baseline specification

	(1)	(2)	(3)	(4)
	$R_{i,t}$ - $R_{i,t}^b$			
ΔNA_t	0.296***	0.346***	0.305***	0.286***
	(10.77)	(14.08)	(11.00)	(9.93)
$R^2*\Delta NA_t$	**0.175*** **			
	(6.05)			
$R^2_{Firm}*\Delta NA_t$		**0.137*** **		**0.155*** **
		(6.21)		**(6.39)**
$R^2_{Industry}*\Delta NA_t$			**0.143*** **	**0.203*** **
			(2.59)	**(3.49)**
$\Delta Cash_t$	0.927***	0.970***	1.039***	1.025***
	(15.89)	(15.26)	(11.14)	(11.17)
$R^2*\Delta Cash_t$	0.162			
	(1.60)			
R^2_{Firm} $*\Delta Cash_t$		0.169*		0.142
		(1.89)		(1.45)
$R^2_{Industry}$ $*\Delta Cash_t$			-0.225	-0.170
			(-1.19)	(-0.83)
$NA_{t-1}*\Delta NA_t$	-0.036***	-0.036***	-0.033***	-0.035***
	(-5.40)	(-5.46)	(-5.11)	(-5.43)
$Leverage_t*\Delta NA_t$	-0.587***	-0.589***	-0.606***	-0.592***
	(-9.27)	(-9.37)	(-9.70)	(-9.36)
$Cash_{t-1}*\Delta Cash_t$	-0.314***	-0.318***	-0.336***	-0.327***
	(-5.84)	(-5.81)	(-5.68)	(-5.89)
$Leverage_t*\Delta Cash_t$	-1.345***	-1.341***	-1.334***	-1.335***
	(-10.38)	(-10.58)	(-10.51)	(-10.59)
R^2	-0.004			
	(-0.41)			
R^2_{Firm}		-0.011		-0.007
		(-1.48)		(-0.78)
$R^2_{Industry}$			0.076**	0.070*
			(2.25)	(1.92)
NA_{t-1}	0.014***	0.015***	0.014***	0.014***
	(6.03)	(6.36)	(6.04)	(5.95)
$Cash_{t-1}$	0.268***	0.266***	0.267***	0.269***
	(6.80)	(6.66)	(6.74)	(6.85)
$Leverage_t$	-0.444***	-0.444***	-0.438***	-0.442***
	(-12.48)	(-12.76)	(-12.48)	(-12.24)
ΔE_t	0.634***	0.636***	0.633***	0.633***
	(14.65)	(14.77)	(14.70)	(14.60)
ΔRD_t	0.699***	0.682***	0.709***	0.709***
	(3.14)	(3.07)	(3.20)	(3.16)
ΔInt_t	-1.408***	-1.388***	-1.406***	-1.407***
	(-5.41)	(-5.33)	(-5.35)	(-5.37)
ΔDiv_t	1.787***	1.830***	1.785***	1.773***
	(5.22)	(5.27)	(5.16)	(5.19)
NF_t	0.346***	0.351***	0.354***	0.344***
	(3.03)	(3.11)	(3.15)	(3.03)
Year fixed-effects	Yes	Yes	Yes	Yes
N	85,652	85,652	85,652	85,652
adj. R-sq	0.232	0.231	0.231	0.232

Panel B: Baseline specification with controls for business fundamental

Panel B presents results of Equation (5) after adding in *ROA*, *Std*(*Sales*), Std(*ROA*), *Sigma*, *Beta*, and *Persistence* as firm fundamental controls. *Std*(*Sales*) is defined as the standard deviation of sales scaled by total assets in the 10-year rolling window preceding year *t*. *Std*(*ROA*) is defined as the standard deviation of realized return on assets in the 10-year rolling window preceding year *t*. *Beta* is estimated using monthly return data in the 10-year rolling window preceding year *t*. *Sigma* is the standard deviation of CAPM model residual in the 10-year rolling window preceding year *t*. *Persistence* is defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the 10-year rolling window preceding year *t*. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	$R_{i,t}$ - $R_{i,t}^b$			
ΔNA_t	0.301***	0.352***	0.307***	0.285***
	(14.87)	(17.06)	(15.78)	(13.87)
$R^2*\Delta NA_t$	**0.173*** **			
	(6.64)			
$R^2_{Firm}*\Delta NA_t$		**0.128*** **		**0.150*** **
		(6.85)		**(6.84)**
$R^2_{Industry}*\Delta NA_t$			**0.151** **	**0.220*** **
			(2.40)	**(3.30)**
$ROA*\Delta NA_t$	0.107***	0.119***	0.121***	0.109***
	(4.83)	(5.15)	(5.17)	(4.86)
$Std(Sales)*\Delta NA_t$	-0.085***	-0.087***	-0.091***	-0.087***
	(-2.87)	(-2.88)	(-2.99)	(-2.92)
$Std(ROA)*\Delta NA_t$	0.265	0.206	0.279	0.287
	(1.53)	(1.18)	(1.54)	(1.61)
$Sigma*\Delta NA_t$	0.386*	0.347	0.369	0.401*
	(1.73)	(1.55)	(1.63)	(1.77)
$Beta*\Delta NA_t$	0.017***	0.019***	0.018***	0.017***
	(2.86)	(3.05)	(2.95)	(2.84)
$Persistence*\Delta NA_t$	-0.009	-0.003	0.002	-0.009
	(-0.97)	(-0.34)	(0.23)	(-0.94)
Control variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	85,652	85,652	85,652	85,652
adj. R-sq	0.267	0.267	0.267	0.267

Table 4: Effect of R^2 on Average Value of Assets

This table reports results from an OLS regression of *Tobin's Q* on R^2 (R^2_{Firm} and $R^2_{Industry}$) plus business fundamental variables introduced in Panel B of Table 3. R^2 is the adjusted R-squared from a regression of net operating earnings after tax (*NOPAT*) in year *t* on net operating assets (*NOA*) in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. $R^2_{Industry}$ is the median R^2 for each Fama-French 48-industry each year and R^2_{Firm} is the difference between R^2 and its corresponding $R^2_{Industry}$. Both firm- and year-fixed effects are included. All standard errors are two-way clustered by firm and year. T-statistics are presented underneath the coefficient estimates. . ***, **, and * denote significance levels for two-sided tests at the 1%, 5%, and 10% level, respectively**.**

Panel A: Panel specification with firm- and year-fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Tobin's Q							
R^2	**0.356*** **				**0.319*** **			
	(15.31)				**(13.61)**			
R^2_{Firm}		**0.328*** **		**0.351*** **		**0.295*** **		**0.317*** **
		(13.79)		**(14.80)**		**(12.54)**		**(13.37)**
$R^2_{Industry}$			**0.258*** **	**0.425*** **			**0.180** **	**0.345*** **
			(3.02)	**(5.09)**			**(2.24)**	**(4.31)**
ROA					0.597***	0.609***	0.650***	0.597***
					(11.57)	(11.77)	(12.02)	(11.52)
Persistence					-0.069***	-0.065***	-0.042***	-0.069***
					(-4.39)	(-4.07)	(-2.69)	(-4.37)
Std(Sales)					0.031	0.0311	0.0268	0.0316
					(0.50)	(0.49)	(0.42)	(0.50)
Std(ROA)					1.333***	1.287***	1.104***	1.333***
					(4.26)	(4.13)	(3.64)	(4.26)
Beta					0.020**	0.021**	0.021**	0.020**
					(2.24)	(2.30)	(2.39)	(2.23)
Sigma					1.278***	1.269***	1.208***	1.277***
					(4.37)	(4.33)	(4.12)	(4.36)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	85,652	85,652	85,652	85,652	85,652	85,652	85,652	85,652
adj. R-sq	0.578	0.577	0.573	0.578	0.593	0.592	0.589	0.593

Panel B: Pastor-Veronesi specification

This table reports results from estimating *Tobin's Q* on R^2 (R^2_{Firm} and $R^2_{Industry}$) and control variables using the Pastor and Veronesi (2003) specification. Age is one minus the reciprocal of one plus the number of years appeared in CRSP database. *Dividend* is a dummy variable that takes 1 if a firm-year pays dividends. *Leverage* is market leverage defined as total debt over the sum of total debt and the market value of equity. *Log*(*Total assets*) is the logarithm of total assets. *VOLP* is the volatility of profitability defined as the standard deviation of return on equity (assets) five years ahead. *ROA* is the current-year return on assets. *ROA*(*i*) is the return on assets in the i^{th} year in the future (up to five years). *Ret*(*i*) is the compounded annual return in the i^{th} year in the future. Regressions are estimated annually and the averages of coefficient estimates from the annual regressions are presented (Fama-MacBeth method). T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
	Tobin's Q			
R^2	**0.426*** **			
	(12.58)			
R^2_{Firm}		**0.311*** **		**0.377*** **
		(8.31)		**(11.10)**
$R^2_{Industry}$			**0.826*** **	**0.977*** **
			(7.75)	**(9.18)**
Age	-1.763***	-1.969***	-2.088***	-1.671***
	(-12.68)	(-13.54)	(-13.14)	(-11.90)
Dividend	-0.126***	-0.130***	-0.126***	-0.123***
	(-7.68)	(-7.90)	(-7.90)	(-7.61)
Log(*Total assets*)	0.0355***	0.0417***	0.0460***	0.0335***
	(6.99)	(8.18)	(8.45)	(6.63)
Leverage	-1.214***	-1.226***	-1.250***	-1.203***
	(-6.37)	(-6.39)	(-6.27)	(-6.30)
ROA	0.784**	0.926***	1.016***	0.774**
	(2.65)	(2.93)	(3.34)	(2.66)
ROA(1)	1.522***	1.529***	1.563***	1.532***
	(6.00)	(6.05)	(6.30)	(6.11)
ROA(2)	1.122***	1.147***	1.136***	1.113***
	(4.31)	(4.10)	(4.22)	(4.40)
ROA(3)	0.650***	0.649***	0.624***	0.627***
	(3.77)	(3.58)	(3.46)	(3.68)
ROA(4)	0.968***	0.993***	1.029***	0.982***
	(4.56)	(4.54)	(4.82)	(4.71)
ROA(5)	1.203***	1.235***	1.266***	1.206***
	(5.11)	(5.09)	(5.27)	(5.18)
VOLP	5.365***	5.248***	5.283***	5.413***
	(14.83)	(14.34)	(14.55)	(15.11)
Ret(1)	-0.334***	-0.339***	-0.344***	-0.334***
	(-8.65)	(-8.65)	(-8.96)	(-8.74)
Ret(2)	-0.275***	-0.281***	-0.287***	-0.277***
	(-6.30)	(-6.26)	(-6.59)	(-6.43)
Ret(3)	-0.241***	-0.246***	-0.251***	-0.242***
	(-5.27)	(-5.25)	(-5.52)	(-5.40)
Ret(4)	-0.178***	-0.183***	-0.190***	-0.181***
	(-4.83)	(-4.77)	(-5.06)	(-4.98)
Ret(5)	-0.138***	-0.141***	-0.148***	-0.141***
	(-4.22)	(-4.20)	(-4.37)	(-4.33)
Average adj. R-sq	0.45	0.44	0.44	0.45
Average N	1,370	1,370	1,370	1,370
Number of Years	35	35	35	35

Table 5: Additional Analyses of the Main Hypothesis

Panel A: Effect of R^2 in subsamples partitioned by the sign of *ROA*

Panel A reports results from an OLS regression of annual excess stock returns on R^2 (R^2_{Firm} and $R^2_{Industry}$) plus firm characteristics on two subsamples. Columns (1) to (4) estimate Equation (5) on the subsample with estimated *ROA* from Equation (4) equal or greater than zero and Columns (5) to (8) estimate Equation (5) on the subsample with estimated *ROA* from Equation (4) lower than zero, respectively. We include all control variables from Table 3, Panel B as well as year fixed effects in this test. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$R_{i,t}$-$R_{i,t}^b$				$R_{i,t}$-$R_{i,t}^b$			
	Estimated *ROA*>=0				Estimated *ROA*<0			
ΔNA_t	0.316***	0.381***	0.300***	0.268***	0.314***	0.309***	0.341***	0.347***
	(15.82)	(19.54)	(14.58)	(12.62)	(10.29)	(12.10)	(13.07)	(12.33)
$R^2*\Delta NA_t$	**0.204*** **				**-0.020**			
	(5.99)				**(-0.46)**			
$R^2_{Firm}*\Delta NA_t$		**0.130*** **		**0.166*** **		**-0.002**		**-0.037**
		(4.41)		**(5.37)**		**(-0.06)**		**(-0.88)**
$R^2_{Industry}*\Delta NA_t$			**0.294*** **	**0.360*** **			**-0.110**	**-0.141***
			(4.22)	**(5.09)**			**(-1.59)**	**(-1.86)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	54,200	54,200	54,200	54,200	31,452	31,452	31,452	31,452
adj. R-sq	0.252	0.251	0.252	0.253	0.293	0.293	0.293	0.293

Panel B: Retention rate analysis

Panel B reports the retention rate of portfolios formed on *ROA* and R^2 (the left panel), or on *ROA* and R^2_{Firm} (the right panel). Each year, we sort firms into four quartiles based on R^2 (R^2_{Firm}) independently. Reported in each cell is the average percentage of firms in each R^2 (R^2_{Firm}) quartile whose *ROA* in the next one-, two- or five-years ahead retain in the same *ROA* quartile.

	R^2				R^2_{Firm}			
1-year ahead retention rate	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*
Lowest R^2	0.565	0.600	0.383	0.623	0.601	0.602	0.418	0.640
Q2	0.716	0.655	0.530	0.651	0.700	0.637	0.533	0.662
Q3	0.802	0.688	0.654	0.701	0.796	0.664	0.662	0.708
Highest R^2	0.833	0.674	0.746	0.758	0.835	0.691	0.736	0.755
2-year ahead retention rate	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*
Lowest R2	0.430	0.417	0.240	0.446	0.456	0.420	0.270	0.451
Q2	0.532	0.487	0.356	0.467	0.518	0.463	0.362	0.477
Q3	0.612	0.520	0.466	0.510	0.606	0.500	0.474	0.524
Highest R2	0.658	0.488	0.582	0.581	0.660	0.521	0.571	0.575
5-year ahead retention rate	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*	Lowest *ROA*	*ROA* Q2	*ROA* Q3	Highest *ROA*
Lowest R2	0.241	0.199	0.137	0.204	0.233	0.198	0.152	0.195
Q2	0.245	0.228	0.192	0.194	0.247	0.222	0.186	0.201
Q3	0.267	0.226	0.236	0.229	0.263	0.213	0.251	0.246
Highest R2	0.257	0.202	0.313	0.292	0.263	0.241	0.305	0.286

Table 6: Controlling for Alternative Measures of Earnings Quality

Panel A: Correlation among R^2 and earnings quality measures

Panel A reports the sample correlation for R^2 and seven earnings quality measures. Pearson correlations are presented in the upper-right corner and Spearman correlations are presented in the lower-left corner, respectively. *AQ* is accruals quality, defined as the negative of the ten-year rolling-window standard deviation of the residual terms from estimating changes in working capital accruals on lagged, current and future cash flows from operations. *Persistence* is earnings persistence, defined as the AR(1) coefficient from the autoregression of earnings per share: $EPS_{i,t}=\rho EPS_{i,t-1}+\varepsilon$ using earnings data in the 10-year rolling window preceding year *t*. *Predict* is earnings predictability, defined as the negative of standard deviation of the AR(1) process of earnings per share. *Smooth* is earnings smoothness, defined as the negative of the ratio of the standard deviation of net income before extraordinary items (scaled by beginning total assets) to the standard deviation of cash flows from operations (scaled by beginning total assets). *Relevance* is value relevance, defined as the adjusted R-squared from a regression of 15-month returns on the level and change in annual earnings before extraordinary items (scaled by beginning market value of equity). *Timeliness* is earnings timeliness, defined as the adjusted R-squared from a reverse regression of annual earnings (before extraordinary items) on variables capturing positive and negative 15-month returns. *Conservatism* is accounting conservatism, defined as the ratio of the coefficient on bad news (negative returns) to good news (positive returns) in the reverse regression. Correlations in bold are statistically significant at the 5% level or lower.

Variable	R^2	*AQ*	*Persistence*	*Predictability*	*Smooth*	*Relevance*	*Timeliness*	*Conservatism*
R^2		**0.22**	**0.18**	**0.18**	**0.17**	**0.08**	**-0.04**	**0.01**
AQ	**0.28**		**0.12**	**0.08**	**0.28**	**0.05**	**-0.02**	0.00
Persistence	**0.19**	**0.14**		**0.10**	**0.10**	**0.03**	**0.03**	0.00
Predict	**0.18**	**0.11**	**0.11**		**0.31**	**0.15**	**0.02**	-0.00
Smooth	**0.22**	**0.38**	**0.09**	**0.28**		**0.11**	**0.01**	**0.01**
Relevance	**0.08**	**0.04**	**0.04**	**0.16**	**0.13**		**0.35**	**0.01**
Timeliness	**-0.04**	**-0.03**	**0.02**	**0.04**	**0.02**	**0.35**		0.00
Conservatism	**0.02**	**0.01**	**0.01**	0.00	**0.03**	**0.07**	0.01	

Panel B: Marginal asset test controlling for other earnings quality measures

Panel B reports results from an OLS regression of annual excess stock returns on R^2, firm characteristics and earnings quality measures. Columns (1) to (7) add one earnings measure at a time and interact the earnings quality measures with ΔNA. Column (8) adds all seven earnings quality measures together and interact all earnings quality measures with ΔNA. We include all control variables in Table 3, Panel B. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					$R_{i,t}$-$R_{i,t}^{B}$			
ΔNA_t	0.296***	0.301***	0.292***	0.318***	0.289***	0.294***	0.301***	0.255***
	(11.95)	(14.87)	(9.11)	(13.47)	(16.71)	(13.58)	(14.04)	(7.68)
R^2*ΔNA_t	**0.181*** **	**0.173*** **	**0.174*** **	**0.167*** **	**0.165*** **	**0.177*** **	**0.177*** **	**0.187*** **
	(5.59)	**(6.64)**	**(6.37)**	**(6.55)**	**(6.28)**	**(5.78)**	**(5.79)**	**(5.49)**
*AQ**ΔNA_t	-0.066							-0.061
	(-0.30)							(-0.28)
*Persistence**ΔNA_t		-0.009						-0.000
		(-0.97)						(-0.03)
*Predict**ΔNA_t			-0.009					-0.034
			(-0.57)					(-1.58)
*Smooth**ΔNA_t				0.019				0.016
				(1.29)				(0.75)
*Relevance**ΔNA_t					0.0324			0.050
					(1.20)			(1.25)
*Timeliness**ΔNA_t						0.016		-0.003
						(0.82)		(-0.10)
*Conservatism**ΔNA_t							0.000	0.000
							(0.21)	(0.45)
Business fundamental variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	66,511	85,652	85,652	85,652	85,497	74,951	74,943	66,200
adj. R-sq	0.264	0.267	0.268	0.267	0.268	0.263	0.263	0.266

Table 7: Robustness and Sensitivity to Alternative Measures of R^2

Panel A: Sensitivity to cash flows-based R^2

Panel A reports results from an OLS regression of annual excess stock returns on R^2 and R^2_{CFO} plus firm characteristics. R^2 is defined as the same as previously. For each firm-year, we estimate a regression of cash from operations in year *t* on net operating assets in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. The adjusted R-squared is R^2_{CFO}. Column (1) estimates Equation (5) with R^2_{CFO} and column (2) estimates Equation (5) using both $R^2$and R^2_{CFO}. Column (3) to (6) estimate Equation (5) on subsamples partitioned accruals quality (*AQ*). *AQ* is defined as the negative of the ten-year rolling-window standard deviation of the residual terms from estimating changes in working capital accruals on lagged, current and future cash flows from operations. Firm-year observations with higher than sample median *AQ* are grouped in the high *AQ* subsample and firm-year observations with l than sample median *AQ* are grouped in the low *AQ* subsample. We include all control variables in Table 3, Panel B. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		Subsample with high *AQ*		Subsample with low *AQ*	
ΔNA_t	0.333***	0.298***	0.271***	0.236***	0.357***	0.327***
	(15.84)	(13.97)	(15.01)	(11.89)	(9.73)	(8.50)
$R^2*\Delta NA_t$		**0.171*** **		**0.160*** **		**0.174*** **
		(7.10)		**(4.91)**		**(4.20)**
$R^2_{CFO}*\Delta NA_t$	0.068**	0.011	0.136***	0.076**	0.043	-0.005
	(2.25)	(0.43)	(3.26)	(2.06)	(0.88)	(-0.11)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Business fundamental variables	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	85,623	85,623	33,255	33,255	33,256	33,256
adj. R-sq	0.266	0.267	0.240	0.241	0.284	0.285

Panel B: Sensitivity to alternative specifications for R^2

Panel B reports results from an OLS regression of annual stock returns on R^2 and S^2 plus firm characteristics. We use two alternative specifications to calculate S^2. In columns (1) to (2), we estimate a regression of net operating earnings after tax in year *t* on net operating earnings after tax in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. In columns (3) to (4), we estimate a regression of net operating earnings after tax in year *t* on net operating assets in year *t*-1 and net operating earnings after tax in year *t*-1 using observations for this firm over the 10-year rolling window preceding year *t*. We include all control variables in Table 3, Panel B. All standard errors are two-way clustered by both firm and year. T-statistics are presented underneath the coefficient estimates. ***, **, and * denote significance levels for two-sided tests at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	$R_{i,t} - R_{i,t}^{b}$			
	S^2 calculated from $NOPAT_t$=$NOPAT_{t-1}$		S^2 calculated from $NOPAT_t$=NOA_{t-1}+$NOPAT_{t-1}$	
ΔNA_t	0.295***	0.282***	0.283***	0.291***
	(13.74)	(13.21)	(12.00)	(12.11)
$R^2*\Delta NA_t$		**0.114*** **		**0.148*** **
		(4.31)		**(3.74)**
$S^2*\Delta NA_t$	0.202***	0.129***	0.159***	0.0401
	(6.23)	(4.42)	(6.20)	(1.18)
Control variables	Yes	Yes	Yes	Yes
Business fundamental variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	79,073	79,073	79,073	79,073
adj. R-sq	0.265	0.266	0.265	0.266