The impact of competitive intensity on the profitability of investments and future stock returns

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I. INTRODUCTION

In this paper we investigate how management's perception of their competitive environment is related to the firm's future profitability and future stock returns. Financial statement analysis textbooks commonly recommend starting the evaluation process by considering the firm's competitive environment and its strategy for operating in its environment (Healy and Palepu 2007, Lundholm and Sloan 2007, Penman 2003). Further, the SEC recommends that the management discussion and analysis (MD&A) section of the firm's 10-K filing include a discussion of any changes in the firm's competitive position if these changes are the cause of the reported results (Exchange Act Release No 34-48960). In this study we examine how management's discussion of the competitive environment in the 10-K reveals information about future accounting performance and future stock market performance. Does management's discussion about their competitive environment predict future operating outcomes? And do these comments reveal something about the firm's future performance that is not fully understood by the stock market?

How management perceives the competitive intensity of the firm's environment can significantly influence their operating and investing decisions. For example, how they price their products depends on how they perceive the threat of substitutes from existing rivals or the threat of new entrants into their markets. How rapidly they invest in assets depends on whether they believe there are many or few rivals, and how contestable the investments are by those rivals. Further, the realized level of competition has an obvious impact on the subsequent payoffs to these operating and investing decisions. A simple model that incorporates these ideas relates a firm's

competitive environment to the rate of diminishing marginal returns on existing assets and on new investments. Economists have long held that business enterprises typically face diminishing marginal returns on investment (Hirshleifer 1970). The intuition is simple: firms tend to make the most profitable investments first and so, as they continue to invest, the rate of return declines. Similarly, firms tend to divest the worst assets first and so, as they divest, the rate of return on the remaining assets improves. However, the rate at which these changes occur, or if they occur at all, is likely to be influenced by the amount of competition a firm faces.

Consistent with these ideas, we find that a firm's return on net operating assets (RNOA) mean reverts more severely, and that returns on new investment in net operating assets diminish faster, when management makes more references to competition in the 10-K. We show that these results are robust to different measures of profitability, different definitions of assets, and after controlling for other measures of competition. Further, the economic significance of the results is shocking. The coefficient of mean reversion on RNOA is -.197 for the lowest decile of competitive intensity and -.292 for the highest decile of competition intensity. And, after controlling for the mean reversion effect, the rate of diminishing returns on investments in net operating assets (NOA) is -.086 for the lowest decile of competitive intensity and -.160 for the highest decile. As another illustration, a firm with a 20% RNOA and a 20% increase in NOA in the current year, and in the lowest decile of competitive intensity, is estimated to have 17.04% RNOA next year; the same firm in the highest decile of competitive intensity is estimated to have only a 13.66% RNOA next year.

After documenting how competition conditions the relation between future changes in RNOA, the past level of RNOA, and past changes in NOA, the next question is whether the stock market appropriately prices these relations. Extensive prior research on the accrual anomaly in accounting, or the asset growth anomaly in finance, documents a negative relation between changes in assets and future abnormal stock returns (see Richardson et al. 2005, Cooper et al. 2008, Hirshleifer et al. 2004 and references therein). Although a number of explanations for the anomaly have been offered, most relevant for our work are the results in Fairfield et al. (2003). They argue that the anomaly arises because the market fails to fully account for diminishing marginal returns to investment, and is surprised when future RNOA changes in response to changes in NOA. Our results take the argument one step further. We find that the mispricing of changes in net operating assets (i.e. accruals) is largest when management's references to competition are the highest. Within the highest quintile of competitive intensity, a portfolio that takes a long position in the lowest quintile of change in NOA (scaled by total assets) and a short position in the highest quintile earns a 21.5% size-adjusted return in the subsequent year; when competitive intensity is in the lowest quintile the same strategy earns only 8.4%. We show that these results are robust to different measures of asset growth and other controls for risk.

Our measure of managements' perceptions of their competitive environment is surprisingly simple: we count the number of references to competition in the firm's 10-K filing, being careful to remove phrases such as "less competitive," and then scale by the total number of words in the document. The result is a firm-specific measure of perceived intensity of competition each year. This measure is intended to capture the

broadest notion of competition – the basic idea that more intense behavior from rivals diminishes a firm's ability to make money. This measure is much finer than the commonly used Herfindahl index, which is defined at the industry level. While many of the references to competition in the 10-K might be boilerplate, we find a surprising amount of variation in our measure. The first quartile value is .28 competition words per thousand 10-K words and the third quartile is .86 words per thousand. Although the measure is weakly correlated with the Herfindahl index, we show that the bulk of the variation in our measure comes from differences between firms within an industry, something that industry concentration measures cannot capture. To validate our measure we compare it to nine other measures of competition taken from the literature, showing that it is weakly related to many of them, but captures something that is distinctly new.

In the next section we discuss our new measure of competition in more detail and develop our hypotheses in the context of the existing literature. We present the results from our tests in section III and conclude in section IV.

II. MEASURES AND HYPOTHESES

What is competition and how do we measure it?

We present a new measure of competitive intensity based on textual analysis of a firm's 10-K filing. Before discussing the construction of the measure, it is useful to consider what we could hope to capture with any measure of competition. How competition affects firm performance is a central question in business and economics. Porter (1979) famously identifies five sources of competitive intensity in an industry

that determine a firm's performance (barriers to entry, threat of substitutes, competitive rivalry, bargaining power of customers and bargaining power of suppliers). A resource-based view of competition emphasizes limiting imitation from rivals by developing unique and rare resources (Barney 1986). Consistent with this view, Brown and Kimbrough (2010) find that the degree to which a firm's earnings co-vary with industry earnings is negatively related to the firm's level of identifiable intangible assets (e.g. patents, copyrights, legal contracts). Another notion of competition, labeled 'Red Queen' competition, describes how firms respond to innovation by rival firms with innovations of their own, resulting in a self-escalating system wherein performance is initially enhanced through innovation but later reduced by the responsive innovation of rivals (Barnett and McKendrick 2004).[1] One can imagine that in different firms and different contexts, management's perception of their competitive environment might be due to any of these concepts. But, as Barnett and McKendrick note, "A defining characteristic of competition is that one organization's solution becomes its rivals' problem." It is this broad construct that we wish to measure with our textual analysis of management's statements in the 10-K.

Empirically, the most common measures of competition found in the literature are concentration ratios, either the Herfindahl index or the four-firm concentration ratio; both focus on the distribution of production across firms within the industry. Concentrated industries, where the bulk of production is done by a few firms, are thought to earn abnormal profits because barriers to entry thwart new entrants and the

[1] The name "Red Queen" competition comes from the Lewis Carroll's Through the Looking Glass (Carroll 1960). When Alice realizes that, although she is running as fast as she can she doesn't seem to get anywhere, the Red Queen responds: "Here, you see, it takes all the running you can do, to keep in the same place."

existing firms can more easily collude (i.e. there is little competitive rivalry).

Although industry concentration ratios have a rich history in economics, they lack precision when it comes to detecting how an individual firm's operating and investing decisions, and the financial consequences of those decisions, might be influenced by competition. First, concentration is only defined at the industry level, while we show that there is considerable variation in managements' perceptions of competition within an industry. Second, industries are sometimes crude ways to group companies. Amazon is classified as "Retail-Catalog & Mail-Order Houses" (SIC code 5961) while eBay is classified as "Services-Business Services" (SIC code 7389) even though they compete intensely in the online retail market. And Accenture, the consulting services business spun out from Arthur Andersen, is also in SIC code 7389 along with eBay, even though they are clearly in very different businesses. More broadly, Rauh and Sufi (2010) offer large-sample evidence showing that SIC-code-based industry definitions bear little relation to the list of competitors that firms disclose in their proxy statements. Third, management decisions are based on their beliefs about competition, which may not correspond with the industry's actual competitive landscape or its concentration ratio. In fact, if concentration ratios where perfect measures of competition, we would expect no variation in managements' discussions of competition within an industry, and concentration ratios would explain all the variation across industries. What we observe is the opposite; there is considerable variation in the number of references to competition within industries and concentration ratios explain very little of the variation across industries. Consistent with this, Dedman and Lennox (2009) survey private firm managers in the UK and find no relation between the

managers' perceptions of their competitive environment and the industry concentration ratio.

We measure management's perceptions of the intensity of the competition they face using textual analysis of the firm's 10-K filing. We count the number of occurrences of "competition, competitor, competitive, compete, competing," including those words with an "s" appended, and then remove any case where "not," "less," "few," or "limited" precedes the word by three or fewer words. To control for 10-K length, we scale the number of competition related words by the total number of words in the 10-K. The resulting measure of perceived competition is

$$PCTCOMP = \frac{NCOMP}{NWORDS},$$

where NCOMP and NWORDS are the net number of occurrences of competition words and the total number of words in a 10-K, respectively. In the empirical analysis, we use the variable COMP, which is the decile-ranked value of PCTCOMP, computed each year, then scaled to be in [0,1]. In robustness checks, we also construct a size-adjusted version and a within industry-year version of PCTCOMP.

To illustrate the types of management statements our measure captures, figure 1 gives six examples. The first example from Columbia Sportswear offers a rather standard reference to existing rivals. The second example from MHI Hospitality talks about how competition may limit investment opportunities when investments are contestable. The third example, also from Columbia Sportswear, refers to competition for inputs, in this case for employees. The fourth example from Open Text Corp. sounds exactly like "Red Queen" competition, describing a system of continual innovation in

response to rivals' innovations. The fifth example from First National Energy Corp illustrates why we remove references to competition that are preceded by the words "no" or "limited." Finally, comparing the fifth example with the sixth example from Oil Dri Corp. illustrates the subtlety of language and why no algorithm will be perfect. Oil Dri's reference to competition should count, and yet it will wrongly be eliminated because it is preceded by "limited by."[2]

Our approach is simple, parsimonious, and effective. To capture the abstract notion of perceived competition in a more structured way would require much more detailed assumptions about the context and linguistic structure of the references to competition notions. However, more complicated methods in computational linguistics and natural language processing literature often lead to minimum improvement at significant costs (Berry 2004). For instance, Turney (2002) uses a simple unsupervised learning algorithm to classify customer reviews of products on epinions.com into positive and negative categories and shows that a parsimonious approach performs equally well compared to more structured models.

Because of its stature in the literature, we make extensive comparisons between our measure and the Herfindahl index. Further, in the beginning of section III we further assess the construct validity of our measure by correlating it with nine other measures of competition offered in Karuna (2007, 2010) and Li (2010). These papers examine how industry-level competition influences management's voluntary disclosures about future operating activities (e.g. management earnings forecasts, segment disclosures,

[2] As a practical matter, the part of the algorithm that eliminates competition references preceded by negative words has little impact on the results. An even simpler algorithm that counts only references to "competition" and "competitor" and these words with an "s" appended produces results that are extremely close to those reported here.

research and development expenditures, order backlog). In contrast, we measure how management's disclosures about competition reveal information about future operating performance.

Hypotheses

We examine how the intensity of a firm's competition environment affects its future financial performance by estimating the impact on the rate of mean reversion in returns on existing assets and the rate of diminishing returns on new investments. There are a number of reasons to expect competition to affect these two rates. Consider a firm with no change to its asset base. Porter's five forces give a laundry list of reasons why firms with unusually high returns on existing on assets will suffer declining returns as competition arrives to erode their competitive advantage. Similarly, firms with unusually low returns on existing assets will benefit from reduced competition as competitors leave their markets in search of higher asset returns elsewhere.

Now consider how competition influences the return on new investments or divestments (i.e. a changing asset base). Absent any competitive forces, returns on investments typically diminish. For example, when growing, Starbucks opens stores at the most profitable locations first so that subsequent investments are necessarily less profitable. Similarly, when shrinking, Starbucks closes the least profitable stores first so that the remaining assets are necessarily more profitable. This intuition is formalized by Warusawitharana (2008). He presents a model where diminishing marginal returns induce firms to invest or divest as their profitability changes. Effectively the firm is attempting to adjust its size until its return on assets equals its cost of capital.

Consistent with this, he finds that a firm's return on assets is a significant predictor of asset sales and purchases. We hypothesize that competition intensifies this effect, as it increases the rate of diminishing marginal returns. Real option theory maintains that in the face of uncertain payoffs, a viable strategy is to wait and only invest when the expected return exceeds some threshold higher than the cost of capital. Grenadier (2002) shows, however, that this threshold decreases in the presence of competition if rival firms can take contestable investment opportunities away from the firm. Simply put, Starbucks will have a lower threshold for investment when making store-opening decisions if there is a possibility that Caribou Coffee or Peet's Coffee will claim the best locations while they wait. Empirically, Akdogu and McKay (2009) find that firms in competitive industries make large investments sooner than firms in monopolistic industries. This leads to our first hypothesis.

H1: The change in next year's RNOA is decreasing in the current level of RNOA and decreasing in the change in current NOA. Both effects become more negative as competition intensifies.

The first half of the hypothesis is supported by considerable prior accounting research. Nissim and Penman (2001) find that return on equity mean reverts to an economy-wide average (about 12%), and Fairfield et al. (2009) show that the return on equity mean reverts to an economy-wide rate and not an industry rate. Cheng (2005) finds that the rate of mean reversion in abnormal return on equity is slower for larger

firms in concentrated industries with barriers to entry.[3] Fairfield et al. (2003) extend these results by estimating the relation between future return on total assets (ROA), current ROA and changes in net operating assets. They find that the future ROA is significantly decreasing in the changes in NOA after controlling for the current ROA. Richardson et al. (2005) find a similar result by regressing future ROA on current ROA and total accruals, where total accruals equals the change in (NOA) plus the change in non-cash net financial assets (non-cash financial assets less financial liabilities). They find that, after controlling for current ROA, future ROA is significantly decreasing in total accruals. They then decompose total accruals and find that the diminishing rates of return are driven primarily by the changes in the net operating assets, as opposed to changes in the net financial assets.

The first half of our paper extends these financial statement analysis results by conditioning the relations between future RNOA, current RNOA and changes in NOA on the level of competitive intensity. After establishing a statistically significant and economically large influence of competition on accounting rates of return, we ask if the stock market correctly prices the moderating influence of competition. There is a wealth of literature documenting the mispricing of accruals or, almost equivalently, asset growth. Recently, Richardson et al. (2005) find that there is an 18% difference in one year ahead size-adjusted returns between the bottom and top deciles of firms sorted on the change in net operating assets (scaled by average total assets). Given that changes in net operating assets are the primary driver of diminishing marginal return on assets in

[3] A different branch of the literature further decomposes return on asset measures into the profit margin times the asset turnover ratio, finding that changes in profit margin are more transitory than changes in asset turnover. See Nissim and Penman (2001), Fairfield and Yohn (2001), and Soliman (2008).

their paper, this suggests that investors do not fully appreciate this effect. Similarly, Cooper et al. (2008) report a 20% difference in next year's returns between the bottom and top deciles of firms sorted on total asset growth after making standard risk adjustments. The explanations for these results vary. Sloan (1996) originally argued that investors fail to appreciate that accruals mean revert faster than cash flows, while Fairfield et al. (2003) argue that they fail to understand diminishing marginal rates of return on investment. Titman et al. (2004) argue that investors fail to account for empire-building management, noting that the mispricing of asset growth is significantly lower in periods when corporate oversight is highest. Hirshliefer et al. (2004) argue that investors simply have limited attention and are mislead by past reported earnings that exceed past cash flows, as captured by the growth in net operating assets. Because we find that competitive intensity has such a strong effect on the rate of diminishing marginal returns on investment, we hypothesize that the mispricing of asset growth will depend on the degree of competition.

H2: The one-year-ahead abnormal returns to a long/short portfolio based on the change in NOA is increasing in the level of competitive intensity.

Note that the hypothesis conditions the asset growth anomaly on competitive intensity, it does not propose a main effect for competition by itself. Further, we propose that competition affects future stock returns through a specific mechanism: investors fail to account for diminishing returns on new investment, causing the asset growth anomaly, and competitive intensity affects the rate of diminishing returns, and should therefore

affect the abnormal returns to an asset growth trading strategy.

III. RESULTS

The Sample

We construct our sample based on the intersection of firm-years available on the EDGAR filings database, where we get the textual data on perceived competition, and the Compustat annual file for years 1995-2006. Most EDGAR filings are not available prior to 1995. We merge these databases based on Compustat GVKEY and the SEC's Central Index Key and eliminate financial firms (SIC codes 6000-6999). For the returns tests we require the firm to have data on CRSP but we do not impose this requirement for the financial performance tests.

We require that the firm have sufficient financial data to compute the return on net operating assets, return on total assets, the change in net operating assets, the change in total assets, and the book-to-market ratio. We also eliminate firms with sales, net operating assets or total assets that are less than zero, or if their market value is less than $1 million. Finally, consistent with prior studies, we eliminate firms with extreme financial ratios. Specifically, we eliminate firms with return on net operating assets or return on total assets greater than 100% or less than -100%, and eliminate firms with sales growth of greater than 1000%. The final sample is 28,361 firm-years for the financial performance tests (which require next year's RNOA data) and 31,596 for the returns tests (which only require the current year's data). All financial variables other than returns are winsorized at the 1% and 99% level.

Descriptive Statistics for PCTCOMP

Summary statistics for PCTCOMP are given by industry in table 1. To establish a benchmark, the grand mean of PCTCOMP is .636 words per thousand words in the 10-K, shown at the bottom of the table. A typical page of a 10-K textual material is approximately 200-300 words, so the mean 10-K has approximately one competition word every 5 to 8 pages. The table is sorted by the average PCTCOMP within each industry (as defined in Fama and French 1997), with Electrical Equipment at the top with .837 competition words per thousand and Precious Metals at the bottom with .202. Note the large standard deviation in PCTCOMP within most industries. In most cases the standard deviation is approximately half the size of the mean. Table 2 quantifies the relative source of variation in PCTCOMP due to across-industry variation and within-industry variation. To control for the variation caused by the general upward trend in the number of competitive words and the total number of 10-K words, for each year the sample-wide average is subtracted from PCTCOMP. The table shows that a regression of this detrended PCTCOMP on the detrended industry average PCTCOMP yields an R^2 of only .07. Little of the variation in PCTCOMP is explained by industry. However, adding the firm average detrended PCTCOMP to the regression increases the R^2 dramatically to .501. Industry membership does not capture much of the variation in management's discussion of the firm's competitive environment, while the measure's average at the firm level captures a significant amount of the variation.

To validate that our measure is picking up the broadly-defined construct "competition," in table 3 we relate it to the nine measures of competition offered in Li

(2010).[4] These are 1) the weighted average of property, plant, and equipment in the industry (IND-PPE); 2) the weighted average of research and development in the industry (IND-R&D), 3) the weighted average of capital expenditures in the industry. For these three weighted average measures, each firm's amount is weighted by the ratio of its segment sales to industry aggregate sales, creating a "representative firm" measure for each industry. Other measures are 4) the product market size (IND-MKTS), measured as the natural log of industry aggregate sales; 5) the four-firm concentration ratio (IND-CON4), measured as the sum of market shares of the four largest firms in an industry; 6) the Herfindahl-Hirschman Index (IND-HHI), measured as the sum of squared market shares of all firms in an industry; 7) the total number of firms in the industry (IND-NUM); 8) the price-cost margin (IND-MGN), measured as industry aggregate sales divided by industry aggregate operating costs; and 9) the return on assets (IND-ROA), measured as industry aggregate operating profit before depreciation divided by industry aggregate total assets. The first four measures are commonly considered to measure competition from new rivals, measures five to seven are considered measures of competition from existing rivals, and measures eight and nine are measures of industry profitability and as such could attract attention from either new or existing rivals. Other than IND-NUM, all constructs are predicted to be decreasing as competition increases. Note also that, consistent with the industrial organization view of competition, all nine measures are defined at the industry level.

Panel A of table 3 gives the value of each alternative competition measure sorted by quintiles of PCTCOMP, along with t-statistics for the difference in means between the

[4] See the discussion in Li (2010) for references to the accounting and economics literature that originally proposed each of these measures, and for precise definitions of the computations of the measures.

top and bottom quintile. Panel B gives the Pearson and Spearman correlations. As table 3 shows, PCTCOMP is weakly related to most of the other proxies for competitive intensity. Two measures have the wrong sign, IND-R&D and IND-MKTS, although the Spearman correlation between IND-MKTS and PCTCOMP is insignificantly positive. The only variable that appears anomalous is IND-R&D, which is increasing with PCTCOMP when the prediction is that it should be decreasing. The argument, based on a resource-model of competition given in Li (2010), is that firms create barriers to entry with R&D expenditures, and yet we find that the firms with the largest R&D expenditures discuss competition the most in their 10-K. However, Brown and Kimbrough (2011) argue and find empirical support for the idea that R&D expenditures only create barriers to entry when they are associated with a recognized intangible asset, such as a patent, copyright or other legal contract. Further, R&D expenditures may represent "Red Queen" competition, and the management's discussion is in response to the need to make continuous innovations in response to rivals' innovations (as the example of Open Text Corp in figure 1 illustrated). In sum, PCTCOMP appears to be a valid measure of competition insofar as it is correlated to other well-known measures, but the relatively low correlations imply that PCTCOMP is not simply a noisy version of another construct.

Variable Definitions and Descriptive Statistics

The variable definitions follow the definitions used in the prior literature (the Xpressfeed codes are italicized in parentheses—see Appendix A for additional description of the variable definitions). We present results for two measures of firm financial performance, the return on net operating assets (RNOA) and the return on total

assets (ROA). RNOA is defined as operating income after depreciation (*oiadp*) divided by the average net operating assets (NOA), where NOA is defined as net accounts receivable (*rect*) + inventories (*invt*) + all other current assets (*aco*) + net property, plant and equipment (*ppent*) + intangibles (*intan*) + all other assets (*ao*) – accounts payable (*ap*) – all other current liabilities (*lco*) – all other liabilities (*lo*). This construction of NOA follows Fairfield et al. (2003). Diminishing returns to investment apply primarily to operating assets and so our primary evidence is based on future changes in RNOA and future returns based on changes in NOA.[5] We also present results for ROA, defined as operating income after depreciation divided by average total assets (*at*), because it is the primary measure used in Fairfield et al. (2003) and Richardson et al. (2005), and growth in total assets is the main variable in the asset growth anomaly given in Cooper et al. (2008). Further, NOA is not a GAAP-defined construct and so it can be constructed various ways; total assets, on the other hand, is unambiguous.

Other financial variables used as descriptive measures, or as controls in the return regressions, are as follows. Market value (MV) is calculated as the natural log of the market value of equity at the end of the fiscal year (price (*prc*) x shares outstanding (*shrout*)). The book-to-market ratio (BM) is included as a risk control, computed as the fiscal year-end book value of common equity (*ceq*) divided by the market value of equity at the end of the fiscal year. Sales growth is defined as the year-over-year percentage change in sales (*sales*).

[5] Financial assets and liabilities may exhibit diminishing returns for sufficiently large changes. However, the rate of return on investments in financial assets doesn't generally vary with the size of the investment until the investment is completely owned and the next best financial investment is made. Similarly, the rate of interest charged on a financial obligation does not vary within a debt issue, but may increase when a new issue is made.

We compute size-adjusted stock returns as the 12 month buy-and-hold return calculated by compounding the 12 monthly returns beginning the first month after the 10-K filing date and then subtracting the corresponding 12 month buy-and-hold return from the same NYSE/AMEX/NASDAQ decile size portfolio. If the firm delists during the return accumulation period we first apply the CRSP delisting return and then assume the proceeds are reinvested in the same size portfolio for the rest of the year. If returns are missing and there is no CRSP delisting return, we use a –35% delisting return for NYSE/AMEX firms and a –55% delisting return for NASDAQ firms, as recommended in Shumway (1997) and Shumway and Warther (1999).

Table 4 gives descriptive statistics for the variables in the study. RNOA has a median of 12% and ROA has a median of 8%, consistent with prior studies. The change in these variables, D_RNOA and D_ROA, both have small negative means and median values of zero. This is the benchmark prediction our model will try to improve upon. The first and third quartiles for RNOA are .03 and .22, respectively, so there is a significant amount of variation available to explain. The change in total assets, D_TA, and the change in net operating assets, D_NOA, are both scaled by total assets at the beginning of the period. Although the change in NOA is no longer a percent change, this makes the two growth variables easier to compare, and is consistent with the definition in Fairfield et al. (2003) and Richardson et al. (2005). Further, because NOA can be very small, scaling by total assets keeps the variable from becoming too extreme. Both changes are small positive amounts at the median and negative at the first quartile.

Table 5 gives the Pearson correlations between the main variables in the study. The variables with the suffix LEAD are the one-year-ahead values that are the dependent

variables in regressions that follow. The most extreme correlation between COMP (the decile-ranked value of PCTCOMP) and the other variables is the -.13 correlation with market value (MV); bigger firms perceive relatively less competition. In terms of D_RNOA_LEAD and D_ROA_LEAD, the two main effects of diminishing marginal returns are present; each measure has a negative correlation with the current period's level (RNOA or ROA) and a negative correlation with the current period's change in assets (D_NOA or D_TA). Further, neither D_RNOA_LEAD nor D_ROA_LEAD is significantly related to firm size, measured as MV.

The Influence of Perceived Competition on Changes in Future Performance

To assess the impact of perceived competition on the rate of diminishing returns on current and new investments, we estimate the following two regressions:

$$D\_RNOA\_LEAD = \beta_0 + \beta_1 * RNOA + \beta_2 * D\_NOA + e \quad (1)$$

$$D\_RNOA\_LEAD = \beta_0 + \beta_1 * RNOA + \beta_2 * D\_NOA + \beta_3 * COMP + \beta_4 * RNOA * COMP + \beta_5 * D\_NOA * COMP + e \quad (2)$$

The first regression gives the estimated diminishing marginal return relations before any consideration of perceived competition and the second regression fully interacts all the variables in the first regression with COMP (recall that COMP is scaled such that it is zero in the lowest decile and 1 in the highest decile). In equation 1, β_1 measures the rate of mean reversion in RNOA absent any change in NOA; as such, it measures the

diminishing marginal rate of return on existing assets. Controlling for the mean reversion in RNOA, the coefficient β_2 estimates the diminishing marginal rate of return on changes in NOA. Both β_1 and β_2 are hypothesized to be negative. In equation 2, these effects are conditioned on the level of COMP, as measured by the coefficients β_4 and β_5, both of which are hypothesized to be negative. All t-statistics are computed with standard errors clustered at the firm level.

Consistent with prior research (Fairfield and Yohn 2001, Soliman 2008, Curtis and Lewis 2010), the sample for the diminishing marginal return regressions in tables 6 and 7 is limited to firms with positive operating income. While RNOA might mean-revert back toward the constant term β_0 for a loss firm, the rate of mean reversion is probably not the same as the rate for profit firms; the earnings of loss firms are more transitory than the earnings of gain firms (Li 2011). Further, the rate of mean reversion toward profit is unlikely to be increased by competition, which is what equation 2 would predict for loss firms. Nevertheless, for completeness, in table 8 we give the results for the full sample.

The first column in table 6 shows significant diminishing marginal returns. The mean reversion coefficient of -.257 implies that RNOA next year is estimated to decrease by over a quarter of the current year's RNOA. The coefficient of -.122 on D_NOA means RNOA will be lowered further by over 10% of the increase in NOA. Column 2 in table 6 reports the model when our measure of competitive intensity is interacted with all the variables in column 1. The significant negative coefficients on COMP_RNOA and COMP_D_NOA show that competition amplifies the rate of diminishing returns on existing assets and new investments, respectively. And the economic

magnitude is impressive. The mean reversion coefficient on RNOA is -.197 when competition is in the lowest decile and is -.197-.095=-.292 when competition is in the highest decile. Similarly, the coefficient on D_NOA is -.086 when competition is in the lowest decile and -.086-.074=-.160 when competition is in the highest decile.[6]

Table 7 presents similar results after replacing the D_RNOA_LEAD with D_ROA_LEAD, RNOA with ROA, and NOA with TA in equations 1 and 2 above. Consistent with the idea that operating assets have greater diminishing returns than financial assets, the results in table 7 are generally weaker than the results in table 6. Nonetheless, there is still a significant mean reversion in ROA and significant diminishing marginal returns on D_TA, and the diminishing return on D_TA is significantly lower when competition is in the highest decile.

Table 8 presents four robustness tests. The first column estimates equation 2 on the full sample that includes loss firms (approximately 19% of the sample). The main effects of diminishing marginal returns on existing assets and new investments is still present and at economically relevant magnitudes. Competition speeds the rate of mean reversion in RNOA by -.040, which is somewhat less than for the profit-only sample, and speeds the rate of diminishing returns on new investment by -.036, also less than in the profit-only sample. Both results remain significant but at lower levels. Column 2 presents results for a size-adjusted measure of perceived competition. The concern is that the weak negative correlation between PCTCOMP and size (measured as MV) is

[6] We also estimate the results using annual cross sectional regressions and averaging the coefficient estimates across the years. Following this approach, the coefficient estimates (t-statistics) are -0.064 (-1.99) and -0.073 (-2.70) for COMP_RNOA and COMP_D_NOA, respectively. However, given the few number of cross sections (12) that we have in our sample relative to prior studies, we place less emphasis on this approach.

causing PCTCOMP to proxy for an underlying size effect. To address this, we regress PCTCOMP on MV each year and use the residual as a size-adjusted PCTCOMP. Column 2 shows that this adjustment has very little effect on the results; the coefficient estimates and significance are very similar to the original results in table 6. The third column in table 8 forces the competition measure to capture only intra-industry variation – something that the traditional industry-based measure of competition cannot do. To construct this measure we create deciles of PCTCOMP within each industry-year (as opposed to each year). The results in column 3 reveal that most of the predictive power from our competition measure comes from variation within the industry. While the coefficients on COMP_RNOA and COMP_D_NOA are smaller than in table 6, they are still statistically significant and economically relevant. Finally, we include the current year change in RNOA (D_RNOA) in the regression to account for any correlation between contemporaneous performance and management's discussion of competition. If, for example, management tends to blame poor performance on competition and this poor performance persists, then our competition measure may simply be picking up information that is already included in the financial results. Column 4 indicates that, while performance persists (i.e., the coefficient on D_RNOA is significantly positive consistent with Fairfield and Yohn 2001), this has little effect on the magnitude of the coefficients on COMP_RNOA and COMP_D_NOA from Table 6.

In table 3 we validated our measure by showing that it was weakly correlated with other accepted measures of competition. Table 9 shows that our results are not due to an omitted-correlated variable problem where PCTCOMP is just proxying for another true competition effect. In particular, for each of the nine alternative

competition measures, we estimate the following equation, where IND-COMP is replaced with the particular alternative measure in question:

$$\begin{aligned} D\_RNOA\_LEAD = {} & \beta_0 + \beta_1 * RNOA + \beta_2 * D\_NOA + \\ & \beta_3 * COMP + \beta_4 * RNOA * COMP + \beta_5 * D\_NOA * COMP + \\ & \beta_3 * IND\text{-}COMP + \beta_4 * RNOA * IND\text{-}COMP + \beta_5 * D\_NOA * IND\text{-}COMP + e \end{aligned} \quad (3)$$

If our measure COMP is simply a noisy proxy for one of the IND-COMP measures, then including them both in the same regression will cause COMP's interactions with RNOA and D_NOA to become insignificant. Table 9 gives the results. Looking across the row for COMP_RNOA and COMP_D_NOA shows that the interactions remain significant in the presence of all nine alternative proxies for competition. Further, the coefficient magnitudes generally remain comparable to the levels in table 6, while the coefficients on the alternative measure interactions are found to be both negative and positive in sign.

An alternative interpretation of the results for our competition measure is that it is somehow proxying for firms with conservative accounting for investments, such as R&D intensive firms.[7] For these conservative firms, RNOA is depressed in early periods of investment growth but accentuated in later periods when investment growth slows. Note, however, that the results for IND-R&D, given in column 2 of table 9, show that this is unlikely to explain our results. The interaction terms COMP_RNOA and COMP_D_NOA

[7] Zhang (2000) and Penman and Zhag (2002) show that the accounting bias due to conservatism predicts future book rate of return.

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remain large and significant, while the coefficients for the interaction terms IND-COMP_RNOA and IND-COMP_D_NOA are both near zero. Further, if growth in recorded NOA is positively correlated with growth in unrecorded R&D assets, then this alternative hypothesis would predict that current the coefficient on COMP_D_NOA would be positive. What we find is the opposite, suggesting that the main effect is clearly one of diminishing marginal returns to new investment, not simply the product of conservative accounting for investments.

In sum, we find that competitive intensity, as measured by management's discussion of competition in the 10-K, has a significant and economically meaningful influence on the rate of diminishing return on existing assets and the rate of diminishing returns on new investments/divestments. The results hold for two different measures of returns, are weaker but still present when the loss firms are included in the sample, hold for a size-adjusted measure of competition and hold for a within-industry measure of competition. The results also remain after including each of nine alternative competition measures in the regression.

To illustrate the effect of competition on the return on existing assets and new investments, figures 2a and 2b graph the estimated coefficients from equation 1 within each quintile of PCTCOMP. As both figures show, as perceived competition increases, the rates of diminishing returns become more negative. The biggest effect on the rate of mean reversion in RNOA comes in the middle quintiles of PCTCOMP, while the biggest effect on the rate of diminishing returns on new investment comes in the lowest PCTCOMP quintile. For both coefficients, however, the effect of competition is a large amplification of the negative rates of return.

The influence of perceived competition on the growth anomaly in stock returns

One explanation for the abnormal stock returns following changes in assets (i.e. the growth anomaly in finance or the accrual anomaly in accounting) is that the market fails to fully account for diminishing marginal returns to investment (Fairfield et al. 2003). Consequently, when assets increase investors are disappointed in the following period when the return on assets falls. Similarly, when assets decline they are pleasantly surprised when the return on assets increases. If this is the case then the amplifying effect that competition has on the rates of diminishing marginal returns should in turn amplify the returns to the growth anomaly. To investigate this, table 10 panel A gives the size-adjusted returns in the year following the 10-K filing (beginning in the month after the filing) for each combination of PCTCOMP quintile and D_NOA quintile.

First, to establish some benchmarks, note that there is a significant asset growth anomaly but no competition anomaly (as a main effect) in our data. To see this, totaling across all levels of PCTCOMP the mean return in the first quintile of D_NOA is .083 and the mean return in the fifth quintile is -.061, resulting in an asset growth hedge return of 14.4%. This is consistent with Richardson et al. (2005), Cooper et al. (2008) and a host of other studies. In contrast, totaling across all levels of D_NOA, the mean return in the bottom quintile of PCTCOMP is .017 and the mean return in the top quintile of PCTCOMP is .040, so the hedge return on perceived competition as a main effect is 3.3%, which is insignificant.

With benchmark returns in place, we assess our hypothesis that competition

amplifies the asset growth anomaly by comparing the return to the asset growth hedge portfolio when PCTCOMP is high (quintile 5) versus when PCTCOMP is low (quintile 1). As the table shows, competition clearly accentuates the asset growth anomaly. In the highest quintile of PCTCOMP the asset growth hedge is 21.5%. In the lowest quintile of PCTCOMP the asset growth hedge is only 8.4%. The difference in these two hedge returns is 13.0% and is significant with a Fama MacBeth t-statistic of 2.97 (computed on the mean annual abnormal returns for the 12 years in our sample). Clearly competition, as measured by management's discussion in the 10-K, plays a crucial role in the asset growth anomaly. The results suggest that investors do not appreciate diminishing returns on new investments/divestments and, in particular, do not appreciate the amplifying effect that competition plays in this relation. Further, table 10 panel B shows that the more traditional measure of competition, the Herfindahl index, does not exhibit the same amplifying influence on the asset growth anomaly. For this table we construct the Herfindahl index based on 3-digit SIC codes (HERF3) to eliminate some of the extreme values that arise using a 4-digit composition. Table 10 shows that the hedge return on D_NOA is only 4.1% larger in the highest quintile of HERF3 than in the lowest quintile.

The returns in table 10 are size-adjusted. As a specification check, in table 11 we estimate Fama-MacBeth regressions on the decile-ranked values of the variables and include the book-to-market ratio and the log of the market value of equity as additional risk controls. All independent variables are sorted into quintile ranks and scaled to be between zero and one. The regressions are estimated separately on each of the 12 years and then the coefficients are averaged across years. Because each variable is scaled to

be between zero and one, the coefficient estimates the hedge return between the top and bottom deciles (although all the middle deciles still affect the estimate). The first two columns show the main effect of the growth anomaly and then the interactive effect of the growth anomaly with our measure of competitive intensity. After controlling for book-to-market and market value, the estimated hedge return on D_NOA is 11.8%. The second column shows the interaction with COMP. When COMP is interacted with D_NOA, the D_NOA main effect is no longer significant but the interaction term is significant. In other words, only when conditioned on the degree of competition does the asset growth anomaly manifest itself. Interpreting some extreme values, when COMP is in the lowest decile (COMP=0), the estimated return to a hedge on D_NOA is .057 and insignificant; when COMP is in the highest decile (COMP=1), the estimated hedge return is .057+.121 = .178 and is significant. Columns 3 and 4 show similar results based on D_TA. There is an asset growth effect shown in column 3, with an estimated hedge return of 10.5%, but when this is interacted with COMP, the hedge returns on D_TA are only present when interacted with COMP. In both sets of tests, after controlling for the book-to-market ratio and market value, the main effect of asset growth is no longer present; it is only significant when conditioned on the level of competition.

Figure 3 illustrates the impact of perceived competition on the asset growth anomaly. For each quintile of PCTCOMP the figure gives the size-adjusted return to the lowest and highest change in NOA quintiles (taken from table 10 panel A). The separation of the two lines shows that there is clearly a main effect due to differences in the asset growth rates. Beyond this, however, note that the lines diverge as PCTCOMP

increases. In the end, the asset growth hedge return in the highest quintile of PCTCOMP is roughly twice as large as the hedge return in the lowest quintile of PCTCOMP.

IV. CONCLUSION

By simply counting the number of times a firm refers to competition in its 10-K, we measure a firm's competitive intensity in a simple yet novel way. We show that this measure is only weakly related to industry concentration and exhibits significant variation across firms within the same industry. Further, we show that competition magnifies the rate at which a firm's return on net operating assets mean reverts and exhibits diminishing returns to new investment. Conditioning a forecast of next year's return on net operating assets by the level of competition results in a significant and economically meaningful difference between high and low levels of competition for the average firm. When our measure of competition is in the highest quintile the rate of diminishing returns on existing assets is about 25% faster, and the rate of diminishing returns on new investments is almost 100% faster, then when competition is in the lowest quintile. Finally, we show that high levels of competition accentuate the well-documented asset growth/accrual stock market anomaly. The size-adjusted hedge return on a long/short portfolio formed on the change in net operating assets is 8.4% in the low quintile of competition but increases to 21.5% in the high quintile of competition. Further, after controlling for the book-to-market effect and size effect, the asset growth anomaly is only present in the subset of firms where our measure of competition is high. These return results are consistent with the prediction that

investors do not fully account diminishing returns on investments, and competition exacerbates this effect.

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Appendix A: Variable Definitions

Variable	Description
NWORDS	The total number of words in the 10-K.
NCOMP	The number of times "competition, competitor, competitive, compete, competing," occurs in the 10-K, including those words with an "s" appended. Cases where "not," "less," "few," or "limited" precedes the word by three or fewer words were removed.
PCTCOMP	Number of occurrences of competition-related words (*NCOMP*) per 1,000 total words in the 10-K (*NWORDS*). In Table 2 only, we de-trended this variable by subtracting the mean for all firms in year *t* from firm *i*'s *PCTCOMP* value (creating variable PCTCOMP_ DETREND).
COMP	A transformation of PCTCOMP, scaled between 0 and 1, calculated by forming decile rank portfolios of PCTCOMP each year, subtracting 1 from the decile rank and dividing by 9.
HERF3	Herfindahl industry concentration measure calculated by summing the squared market shares of all firms in an industry based on sales. Industry is defined at the 3 digit level using the historical SIC code from CRSP (*hsiccd*). The measure is calculated annually for each industry and is multiplied by (-1) such that competition is increasing in the magnitude of this variable.
RET	The 12 month buy and hold return calculated by compounding the 12 monthly returns beginning the first month after the 10-K filing date and adjusting the return by subtracting the corresponding 12 month buy and hold return from the same NYSE/AMEX/NASDAQ decile size portfolio.
RNOA	Return on net operating assets calculated by dividing operating income after depreciation ($oiadp_{i,t}$) by the average net operating assets (($NOA_{i,t}$ + $NOA_{i,t-1}$)/2). D_RNOA is the change in this variable from year *t-1* to year *t*; while D_RNOA_LEAD is the change in this variable from year *t* to year *t+1*.
NOA	Net operating assets calculated as net accounts receivable (*rect*) + inventories (*invt*) + all other current assets (*aco*) + net property, plant and equipment (*ppent*) + intangibles (*intan*) + all other assets (*ao*) – accounts payable (*ap*) – all

	other current liabilities (*lco*) – all other liabilities (*lo*). D_NOA is the change in this variable from year *t-1* to year *t* scaled by average total assets.
ROA	Return on assets calculated by dividing operating income after depreciation ($oiadp_{i,t}$) by the average total assets (($at_{i,t-1}$ + $at_{i,t}$)/2). ROA_LEAD is the value of this variable in year *t+1*. D_ROA_LEAD is the change in this variable from *t* to *t+1*.
TA	Total assets ($at_{i,t}$). D_TA is the change in this variable from year *t-1* to year *t* scaled by the average total assets.
BM	Book to market ratio calculated as the fiscal year-end book value of common equity ($ceq_{i,t}$) divided by the market value of equity at the end of the fiscal year (price (*prc*) x shares outstanding (*shrout*)).
MV	MV_$ is market value of equity at the end of the fiscal year (price (*prc*) x shares outstanding (*shrout*)). MV is the natural log of MV_$. Firms with market values less than $1 million have been deleted.
SGROWTH	Year-over-year percentage change in sales calculated as ($Sale_{i,t} - Sale_{i,t-1}$)/$Sale_{i,t-1}$.

Figure 1
Competition References

1) "The markets for sportswear, outerwear, footwear, and related accessories and equipment are highly competitive. In each of our geographic markets, we face significant competition from numerous and varying competitors. Some of our large wholesale customers also pose a significant competitive threat by marketing apparel, footwear and equipment under their own private labels." Columbia Sportswear Co., 2-27-2009

2) "We compete for investment opportunities with entities that have substantially greater financial resources than we do. These entities generally may be able to accept more risk than we can prudently manage. This competition may generally limit the number of suitable investment opportunities offered to us. This competition may also increase the bargaining power of property owners seeking to sell to us, making it more difficult for us to acquire new properties on attractive terms." MHI Hospitality Corp, 3-25-2009

3) "Our future success will also depend on our ability to attract and retain key managers, designers, sales people and others. We face intense competition for these individuals worldwide, and there is a significant concentration of well-funded apparel and footwear competitors in and around Portland, Oregon." Columbia Sportswear Co. 2-27-2009

4) "The markets for our products are intensely competitive, and are subject to rapid technological change and other pressures created by changes in our industry. We expect competition to increase and intensify in the future as the pace of technological change and adaptation quickens and as additional companies enter into each of our markets. Numerous releases of competitive products have occurred in recent history and may be expected to continue in the near future." Open Text Corp, 8-26-2008

5) "We believe that there is currently no or limited competition in the markets we plan to pursue, and there is an increasing demand due to the rising levels of installed wind energy capacity worldwide." First National Energy Corp, 1-4-2011

6) "Our ability to acquire additional reserves in the future could be limited by competition from other companies for attractive properties." Oil Dri Corp, 10-12-2010

FIGURE 2a: Coefficient B1 by PCTCOMP Quintile in:
D_RNOA_LEAD = B0 + B1*RNOA + B2*D_NOA

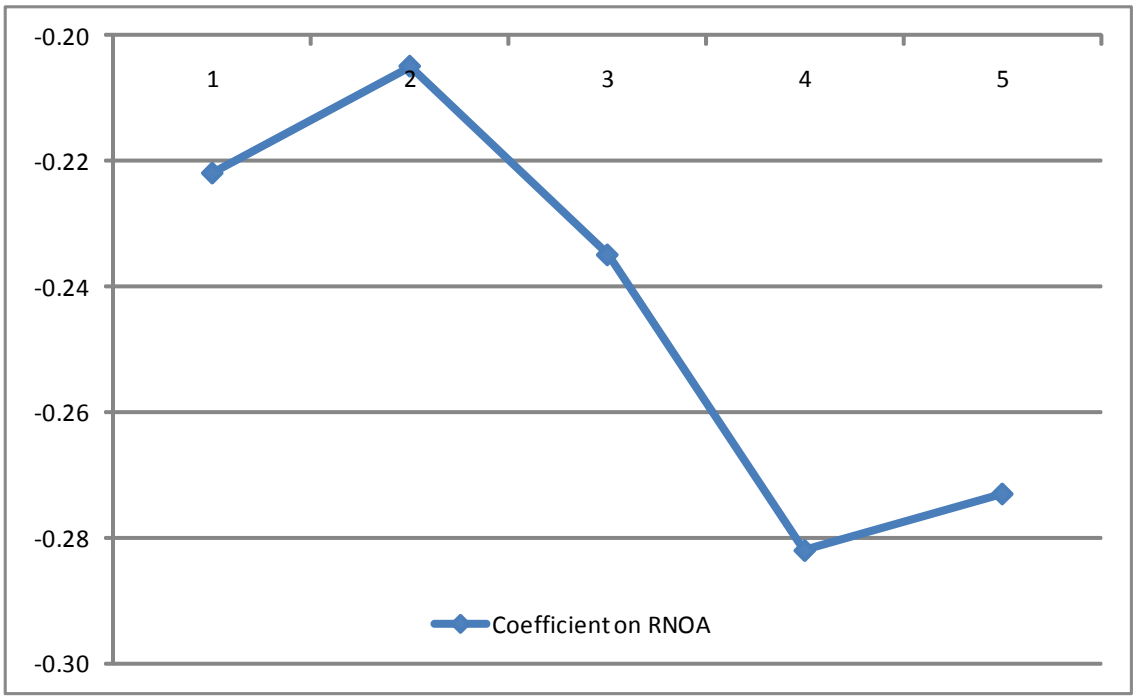

FIGURE 2b: Coefficient B2 by PCTCOMP Quintile in:
D_RNOA_LEAD = B0 + B1*RNOA + B2*D_NOA

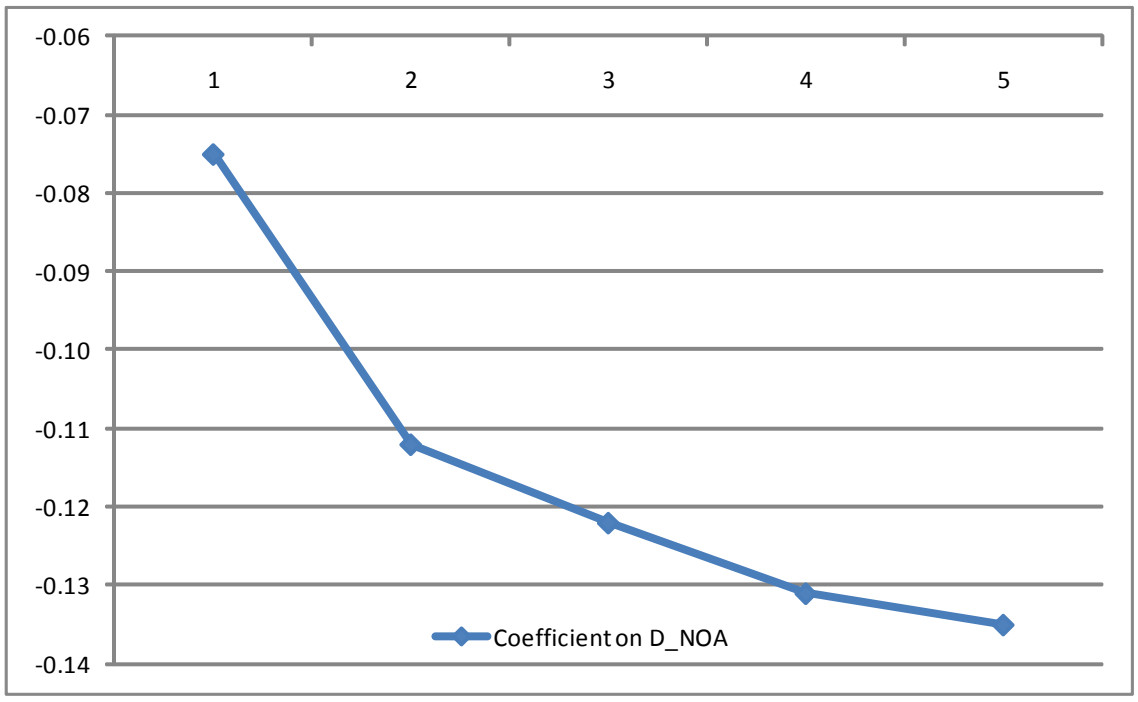

FIGURE 3: Future Size-adjusted Returns by PCTCOMP Quintile for Low and High D_NOA

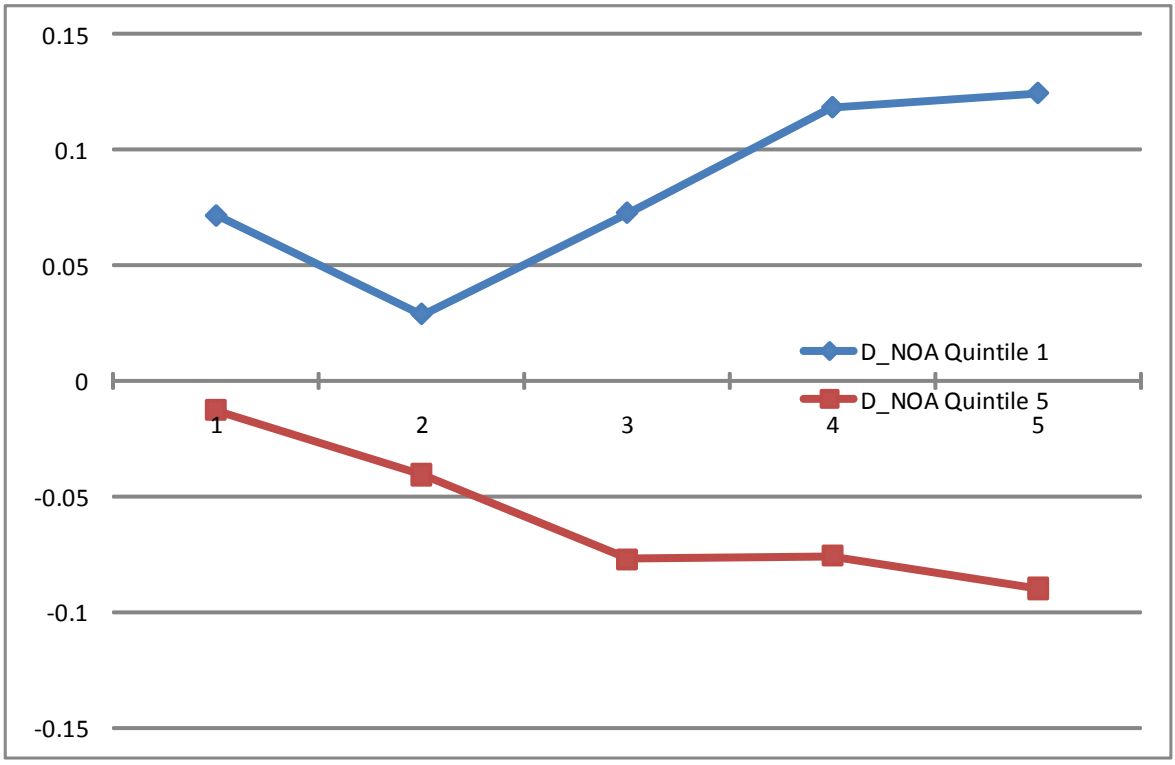

TABLE 1: Competition Measure by Fama-French Industry

Fama-French Industry	Mean	Median	Std. Dev.	n
Electronic Equipment	0.837	0.779	0.416	193
Computers	0.826	0.742	0.381	105
Telecommunications	0.812	0.723	0.387	115
Measuring and Control Equip	0.803	0.709	0.379	78
Electrical Equipment	0.781	0.730	0.435	70
Medical Equipment	0.744	0.702	0.339	103
Business Services	0.713	0.643	0.381	406
Recreational Products	0.698	0.581	0.386	30
Alcoholic Beverages	0.698	0.606	0.328	8
Miscellaneous	0.663	0.561	0.353	14
Retail	0.659	0.589	0.343	82
Pharmaceutical Products	0.656	0.639	0.204	104
Wholesale	0.636	0.573	0.291	161
Textiles	0.609	0.507	0.349	9
Machinery	0.608	0.522	0.373	132
Printing and Publishing	0.586	0.621	0.207	25
Shipbuilding, Railroad Eq	0.585	0.457	0.359	5
Business Supplies	0.578	0.545	0.292	37
Food Products	0.575	0.488	0.362	35
Automobiles and Trucks	0.569	0.519	0.305	57
Steel Works, Etc.	0.568	0.538	0.254	68
Rubber and Plastic Products	0.560	0.512	0.306	28
Construction Materials	0.557	0.567	0.212	60
Healthcare	0.556	0.497	0.266	79
Aircraft	0.553	0.469	0.243	12
Entertainment	0.545	0.443	0.285	55
Construction	0.543	0.496	0.313	50
Consumer Goods	0.542	0.465	0.250	55
Apparel	0.540	0.509	0.244	32
Personal Services	0.536	0.484	0.302	34
Candy and Soda	0.533	0.522	0.210	9
Utilities	0.522	0.446	0.307	134
Transportation	0.521	0.516	0.232	111
Defense	0.512	0.430	0.236	9
Chemicals	0.501	0.489	0.226	70
Fabricated Products	0.500	0.462	0.258	13
Shipping Containers	0.490	0.560	0.194	6
Agriculture	0.437	0.458	0.142	7
Restaurants, Hotel, Motel	0.420	0.368	0.227	35
Petroleum and Natural Gas	0.386	0.341	0.216	157
Nonmetallic Mines	0.336	0.259	0.182	9
Precious Metals	0.202	0.160	0.185	8
Total	0.636	0.568	0.348	2,810

This table presents the industry mean, median and standard deviation for PCTCOMP. To calculate the industry mean, the mean of PCTCOMP is calculated for each firm with at least 5 years of data and the industry statistics are calculated from the firm means for each industry with at least 5 firms.

TABLE 2: Analysis of the Variation in Pctcomp Between Industries, Within Industries and Within Firms

	Industry Average Only	Industry Average and Firm Average
PCTCOMP_IND	0.832***	0.111***
	(20.69)	(10.24)
PCTCOMP_FIRM		0.985***
		(471.76)
Constant	-0.001	0.000
	(-0.18)	(1.41)
R-squared	0.07	0.501
N	23,946	23,946

This table presents the results of regressing PCTCOMP_DETREND on PCTCOMP_IND (industry average PCTCOMP_DETREND) and PCTCOMP_FIRM (time-series firm average of PCTCOMP_ DETREND). PCTCOMP_DETREND is defined as $PCTCOMP_{i,t}$ - Annual Mean of $PCTCOMP_t$, removing the time trend variation. To be included in the regression, each firm is required to have at least 5 years of data and each industry-year is required to have at least 5 firms. See Appendix A for variable definitions. Heteroscedasticity robust t-statistics clustered at the firm level are presented below the coefficient estimates. *, **, *** indicate significance at 10%, 5%, and 1%, respectively.

TABLE 3: Relation Between PCTCOMP and Various Industry Competition Measures

Panel A: By PCTCOMP Quintile

	Potential Entrants				Existing Rivals			Profitability	
PCTCOMP Quintile	IND-PPE↓	IND-R&D↓	IND-CPX↓	IND-MKTS↓	IND-HHI↓	IND-CON4↓	IND-NUM↑	IND-MGN↓	IND-ROA↓
1	3,885.7	87.2	390.1	9.33	0.299	0.720	49.58	1.124	0.127
2	3,155.6	117.8	319.2	9.31	0.298	0.733	47.91	1.111	0.123
3	2,822.4	145.2	292.7	9.33	0.284	0.724	52.62	1.108	0.124
4	2,557.9	179.9	284.4	9.34	0.276	0.723	58.51	1.109	0.126
5	2,635.3	251.6	319.0	9.55	0.261	0.704	78.52	1.110	0.127
Diff (5) - (1)	-1,250.3***	164.4***	-71.0***	0.22***	-0.038***	-0.016***	28.94***	-0.014***	0.001
t-stat	(-13.48)	(26.93)	(-6.79)	(5.94)	(-7.80)	(-3.76)	(14.80)	(-5.69)	(0.65)
Relation consistent with arrow?	Y	N	Y	N	Y	Y	Y	Y	N (n/s)

Panel B: Correlation coefficients between PCTCOMP and Industry Measures

	Pearson	Spearman
IND-PPE	0.102	0.111
IND-R&D	-0.203	-0.201
IND-CAPX	0.023	0.042
IND-MKTS	-0.023	0.009
IND-HHI	0.064	0.060
IND-CON4	0.091	0.087
IND-NUM	0.198	0.167
IND-MGN	0.041	0.056
IND-ROA	-0.050	-0.053

This table presents the relation between PCTCOMP and various industry level competition measures. Panel A presents the results by quintile of PCTCOMP. The arrows represent the expected relation between the intensity of competition in the industry and the competition measure. Difference in means tests between the means of quintiles (5) and (1) are presented at the bottom of each column. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Panel B presents univariate correlations. In Panel B, all competition measures except IND-NUM are multiplied by (-1) such that all are increasing in the level of compeition. We follow Li (2010) in defining the industry competition variables.

TABLE 4: Summary Statistics

Variable	Mean	Min	p25	Median	p75	Max	SD	n
PCTCOMP	0.64	0.00	0.28	0.51	0.86	4.99	0.51	31,596
COMP	0.50	0.00	0.22	0.56	0.78	1.00	0.32	31,596
RET	0.03	-2.25	-0.37	-0.07	0.23	16.90	0.80	31,596
RNOA	0.10	-1.00	0.03	0.12	0.22	1.00	0.27	31,596
D_RNOA_LEAD	-0.03	-1.12	-0.07	0.00	0.04	0.70	0.23	29,126
D_NOA	0.07	-0.52	-0.03	0.04	0.14	0.88	0.21	31,596
ROA	0.06	-0.87	0.02	0.08	0.13	0.93	0.13	31,596
D_ROA_LEAD	-0.01	-0.36	-0.04	0.00	0.02	0.26	0.09	29,176
D_TA	0.11	-0.63	-0.03	0.07	0.20	1.21	0.29	31,596
TA	2,524.6	0.5	73.1	246.4	1,004.3	750,507.0	15,375.4	31,596
BM	0.65	-0.82	0.29	0.50	0.82	3.68	0.63	31,596
MV	5.55	0.00	4.06	5.46	6.90	13.14	2.06	31,596
SGROWTH	0.20	-1.00	-0.01	0.10	0.26	9.90	0.57	31,596

This table presents the summary statistics for the variables used in this paper. Observations with RNOA > 1, RNOA < 1, MV < 0 (i.e., market value of equity < $1 million), SGROWTH < -1, or SGROWTH > 10 have been eliminated. All other variables, except PCTCOMP, COMP, RET, and TA have been winsorized at the 1% and 99% level. See Appendix A for variable definitions.

TABLE 5: Pearson Correlations

	COMP	RET	RNOA	RNOA_LEAD	D_RNOA_LEAD	D_NOA	ROA	ROA_LEAD	D_ROA_LEAD	D_TA	BM	MV
RET	0.02											
RNOA	-0.05	*0.01*										
RNOA_LEAD	-0.04	0.08	0.39									
D_RNOA_LEAD	-0.05	0.20	-0.15	0.45								
D_NOA	*0.00*	-0.07	0.18	0.05	-0.11							
ROA	-0.07	*0.01*	0.90	0.35	-0.11	0.24						
ROA_LEAD	-0.09	0.15	0.65	0.53	0.49	0.09	0.73					
D_ROA_LEAD	-0.04	0.25	-0.21	0.30	0.85	-0.18	-0.22	0.48				
D_TA	0.02	-0.07	0.25	0.07	-0.12	0.83	0.26	0.11	-0.17			
BM	-0.01	0.05	-0.19	-0.07	0.02	-0.13	-0.19	-0.17	0.01	-0.18		
MV	-0.13	-0.02	0.32	0.15	0.02	0.15	0.34	0.30	*0.01*	0.19	-0.42	
SGROWTH	0.03	-0.05	0.02	-0.02	-0.07	0.43	0.02	-0.04	-0.09	0.48	-0.11	0.09

This table presents pairwise Pearson correlations between the variables of interest in this study. All correlations except those italicized are significant at the 5% level or higher. See Appendix A for varaible definitions.

TABLE 6: Pooled Regressions of Changes in Return on Net Operating Assets and Competition

Independent variables	*Dependent variable:* D_RNOA_LEAD	
RNOA	-0.257***	-0.197***
	(-26.35)	(-11.14)
D_NOA	-0.122***	-0.086***
	(-22.89)	(-10.30)
COMP		-0.002
		(-0.30)
COMP_RNOA		-0.095***
		(-3.33)
COMP_D_NOA		-0.074***
		(-4.47)
Constant	0.028***	0.027***
	(16.67)	(9.12)
R-squared	0.120	0.125
N	22,804	22,804

This table presents the results of a pooled OLS regression of future changes in RNOA (D_RNOA_LEAD) on the current level of RNOA, D_NOA, and COMP. Firms with negative RNOA have been deleted for this analysis. See Appendix A for variable definitions. Heteroscedasticity robust t-statistics clustered at the firm level are presented below the coefficient estimates. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

TABLE 7: Pooled Regressions of Changes in Return on Assets and Competition

Independent variables	*Dependent variable:* D_ROA_LEAD	
ROA	-0.165***	-0.160***
	(-19.48)	(-10.22)
D_TA	-0.040***	-0.027***
	(-18.19)	(-7.25)
COMP		-0.009***
		(-3.23)
COMP_ROA		-0.005
		(-0.18)
COMP_D_TA		-0.023***
		(-3.48)
Constant	0.007***	0.011***
	(8.11)	(7.13)
R-squared	0.067	0.071
N	22,804	22,804

This table presents the results of a pooled OLS regression of future changes in ROA (D_ROA_LEAD) on the current level of ROA, D_TA, and COMP. Firms with negative ROA have been deleted for this analysis. See Appendix A for variable definitions. Heteroscedasticity robust t-statistics clustered at the firm level are presented below the coefficient estimates. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

TABLE 8: Robustness Tests of Changes in Return on Net Operating Assets and Competition

	Dependent variable: D_RNOA_LEAD			
	(1)	(2)	(3)	(4)
	Including	Size-adjusted	Industry-adjusted	Including
Independent variables	Loss Firms	PCTCOMP	COMP	D_RNOA
RNOA	-0.218***	-0.209***	-0.222***	-0.204***
	(-17.54)	(-11.58)	(-12.64)	(-11.58)
D_NOA	-0.081***	-0.084***	-0.098***	-0.081***
	(-9.03)	(-9.78)	(-11.47)	(-9.64)
D_RNOA				0.077***
				(6.71)
COMP	-0.022***	0.004	-0.002	-0.002
	(-5.29)	(0.81)	(-0.34)	(-0.36)
COMP_RNOA	-0.040**	-0.075***	-0.067**	-0.092***
	(-2.09)	(-2.61)	(-2.32)	(-3.23)
COMP_D_NOA	-0.036**	-0.081***	-0.047***	-0.066***
	(-2.16)	(-4.84)	(-2.93)	(-4.05)
Constant	0.031***	0.025***	0.028***	0.027***
	(13.07)	(8.36)	(9.25)	(9.18)
R-squared	0.151	0.123	0.123	0.132
N	28,361	22,804	22,053	22,804

This table presents the results of a pooled OLS regression of future changes in RNOA (D_RNOA_LEAD) on the current level of RNOA, D_NOA, and COMP. Column (1) includes firms with RNOA < 0. Column (2) presents results after size-adjusting PCTCOMP. PCTCOMP is size-adjusted by using the residuals of annual regressions of PCTCOMP on MV and then forming deciles as with the unadjusted PCTCOMP variable. Column (3) presents results after industry-adjusting COMP. COMP is industry-adjusted by creating the COMP deciles of PCTCOMP by year and industry (rather than just year) for those industry-years with at least 10 firms. Column (4) presents the results after including current year change in RNOA (D_RNOA). See Appendix A for variable definitions. Heteroscedasticity robust t-statistics clustered at the firm level are presented below the coefficient estimates. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

TABLE 9: Tests of Changes in Return on Net Operating Assets Controlling for Industry Competition

	Dependent variable: D_RNOA_LEAD								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Independent variables	IND-PPE	IND-R&D	IND-CAPX	IND-MKTSIZE	IND-CON4	IND-HHI	IND-NUM	IND-MGN	IND-ROA
RNOA	-0.246***	-0.221***	-0.248***	-0.262***	-0.149***	-0.155***	-0.179***	-0.214***	-0.196***
	(-10.68)	(-9.07)	(-10.72)	(-10.55)	(-6.25)	(-6.49)	(-8.12)	(-9.51)	(-8.58)
D_NOA	-0.090***	-0.153***	-0.092***	-0.110***	-0.087***	-0.087***	-0.078***	-0.083***	-0.125***
	(-7.72)	(-9.52)	(-7.61)	(-8.69)	(-7.27)	(-7.08)	(-6.70)	(-7.06)	(-9.43)
COMP	0.001	0.001	-0.001	-0.002	-0.002	-0.001	-0.002	-0.000	-0.000
	(0.16)	(0.21)	(-0.18)	(-0.31)	(-0.30)	(-0.24)	(-0.27)	(-0.00)	(-0.01)
COMP_RNOA	-0.097***	-0.071**	-0.092***	-0.083***	-0.079**	-0.084***	-0.063**	-0.096***	-0.094***
	(-3.07)	(-2.28)	(-2.91)	(-2.64)	(-2.50)	(-2.67)	(-2.04)	(-3.06)	(-2.99)
COMP_D_NOA	-0.075***	-0.055***	-0.076***	-0.078***	-0.078***	-0.077***	-0.083***	-0.075***	-0.075***
	(-4.16)	(-3.14)	(-4.23)	(-4.37)	(-4.34)	(-4.30)	(-4.72)	(-4.18)	(-4.23)
IND-COMP	-0.000***	0.000***	0.000	-0.002***	0.000	0.006	-0.000***	0.002	-0.060*
	(-4.34)	(5.26)	(0.47)	(-2.61)	(0.06)	(1.00)	(-6.01)	(0.13)	(-1.84)
IND-COMP_RNOA	0.092***	0.060**	0.090***	0.119***	-0.112***	-0.095***	-0.047*	0.035	-0.013
	(3.63)	(2.12)	(3.61)	(4.12)	(-3.72)	(-3.21)	(-1.85)	(1.28)	(-0.43)
INC-COMP_D_NOA	0.005	0.109***	0.012	0.051***	0.005	0.004	0.001	-0.008	0.073***
	(0.30)	(4.88)	(0.69)	(2.84)	(0.27)	(0.20)	(0.03)	(-0.46)	(4.07)
Constant	0.023***	0.027***	0.027***	0.008	0.027***	0.028***	0.033***	0.028*	0.019***
	(6.82)	(8.38)	(8.23)	(1.04)	(4.63)	(7.85)	(9.66)	(1.89)	(3.71)
R-squared	0.128	0.138	0.129	0.130	0.130	0.128	0.139	0.127	0.127
N	19,644	19,644	19,644	19,644	19,644	19,644	19,644	19,644	19,644

This table presents the results of a pooled OLS regression of future changes in RNOA (D_RNOA) on the current level of RNOA, D_NOA, and COMP after controlling for various industry-level measures of competition. We follow Li (2010) for the definition of the industry competition measures. To be consist with the calculation of COMP, we use deciles of deciles of the industry competition measures, scaled between 0 and 1. See appendix A for other variable definitions. Heteroscedasticity robust t-statistics clustered at the firm level are presented below the coefficient estimates. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

TABLE 10: Analysis of Stock Market Returns Across Quintiles

Panel A: PCTCOMP and D_NOA quintiles

	PCTCOMP quintile						
D_NOA quintile	1	2	3	4	5	Total	Diff (5) - (1)
1	0.071	0.029	0.073	0.119	0.125	0.083	0.053
2	0.040	0.044	0.063	0.041	0.085	0.055	0.045
3	0.009	0.051	0.048	0.060	0.064	0.048	0.055
4	-0.026	0.001	0.030	0.040	0.011	0.012	0.038
5	-0.013	-0.041	-0.077	-0.076	-0.090	-0.061	-0.077
Total	0.017	0.018	0.027	0.036	0.040	0.027	
Diff (5) - (1)	0.084	0.069	0.150	0.194	0.215		
Diff-in-diff			0.130**				
t-stat			(2.97)				

Panel B: HERF3 and D_NOA quintiles

	HERF3 quintile						
D_NOA quintile	1	2	3	4	5	Total	Diff (5) - (1)
1	0.066	0.053	0.072	0.122	0.094	0.083	0.028
2	0.028	0.017	0.097	0.069	0.042	0.055	0.014
3	0.043	0.027	0.040	0.080	0.053	0.048	0.010
4	-0.004	-0.017	0.035	0.033	-0.006	0.012	-0.002
5	-0.079	-0.061	-0.025	-0.028	-0.091	-0.061	-0.012
Total	0.010	0.007	0.043	0.058	0.016	0.027	
Diff (5) - (1)	0.145	0.114	0.096	0.150	0.185		
Diff-in-diff			0.041				
t-stat			(0.80)				

This table presents the annual means of size adjusted returns partitioned by quintiles of PCTCOMP and D_NOA (Panel A) and HERF3 and D_NOA (Panel B). The differences between quintiles (5) and (1) are presented at the end of each row and column. See Appendix A for variable definitions. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Only diff-in-diff significance levels are presented.

TABLE 11: Fama-Macbeth Regressions of Future Stock Returns, Asset Growth and Competition

Independent variables	*Dependent variable:* RET_{t+1}			
D_NOA	-0.118**	-0.057		
	(-2.73)	(-1.63)		
COMP_D_NOA		-0.121***		
		(-3.70)		
D_TA			-0.105**	-0.052
			(-2.26)	(-1.07)
COMP_D_TA				-0.105**
				(-2.87)
COMP		0.101		0.093
		(1.41)		(1.57)
BM	0.094**	0.094**	0.090**	0.090**
	(2.45)	(2.73)	(2.38)	(2.70)
MV	0.007	0.007	0.011	0.011
	(0.18)	(0.20)	(0.28)	(0.30)
Constant	0.036	-0.015	0.029	-0.018
	(0.95)	(-0.63)	(0.76)	(-0.86)
R-squared	0.012	0.015	0.011	0.015
N	31,596	31,596	31,596	31,596

This table presents the results of Fama-Macbeth regressions of size adjusted returns on competition, changes in assets, and control variables. The coefficient estimates are averages obtained from 12 annual regressions. The t-statistics are based on averages and standard deviations of the 12 parameter estimates obtained from the annual regressions. All independent variables have been transformed into quintile ranks and scaled between 0 and 1. See Appendix A for variable definitions. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.