Information Transparency and Profitability Convergence

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ABSTRACT

We investigate the effect of information transparency on the competitive environment by examining whether information transparency at the industry level is associated with industry-level earnings persistence. Theory predicts that competition reduces the sustainability of abnormally high and abnormally low profits, thereby reducing overall earnings persistence. Therefore, if information transparency facilitates competition, we expect more transparent industries to have lower earnings persistence. We measure industry-level information transparency as the industry-level future earnings response coefficient. Consistent with our expectation, we find that transparency is associated with lower earnings persistence. This finding suggests that information transparency facilitates the competitive forces that lead profits to converge within an industry. We corroborate this interpretation by demonstrating that information transparency is positively associated with the degree to which competitors enter or exit an industry in anticipation of changes in the industry's profitability outlook. Our study provides new and important evidence that information transparency facilitates product market competition.

Keywords: Information Transparency; Profitability Convergence; Earnings Persistence; Product Market Competition; Abnormal Profits

I. INTRODUCTION

In a competitive market, firms with abnormally high profits attract entry by other firms that offer similar products at lower prices until abnormally high profits are eroded. Meanwhile, firms with abnormally low profits adapt, are acquired by their competitors, or are driven from the market. Thus, the competitive process contributes to a lower persistence of both abnormally high and abnormally low profits and, consequently, a lower overall persistence of earnings. We use this framework to investigate the effect of information transparency on the competitive environment by examining whether information transparency at the industry level is associated with industry-level earnings persistence. If information transparency facilitates competition then earnings persistence should be lower in more transparent industries.

Our study is related to prior research on why abnormal profits persist despite the theorized effects of competition (Brozen 1971; Qualls 1974; Mueller 1977; Mueller 1986; Jacobsen 1988; Mueller 1990; Waring 1996McGahan and Porter 1997; McGahan and Porter 1999; Roberts 1999; Roberts and Dowling 2002; McGahan and Porter 2003). Prior empirical work has documented various forms of barriers to entry to explain why abnormal profits persist but has not focused on the role of information transparency (Bain 1951; Bain 1956; Williamson 1963; Mann 1966; Brozen 1971; Qualls 1974; Mueller 1977; Mueller 1986; Mueller 1990; Waring 1996; Roberts 1999; Carlton 2004; McAfee, Mialon, Williams 2004; Roberts and Dowling 2002). Our focus on information transparency is based on the knowledge that agents require information in order to take the competitive actions that ultimately erode abnormal profits. We therefore argue that the better the information incumbents and potential entrants have about the economic performance of firms in an industry, the better able they are to compete. Despite the theorized importance of

transparency in promoting competition, prior research has not explored the impact of transparency on the competitive environment.

We capture information transparency using the future earnings response coefficient (*FERC*), which represents the extent to which current stock returns reflect foreknowledge of future earnings realizations. We measure industry-level *FERC* as the coefficient on future earnings in annual, industry-level regressions of current returns on future earnings, as well as on current and past earnings. A higher coefficient on future earnings indicates that investors have greater foresight about future earnings prospects for the industry. Prior research indicates that *FERC* is higher in more transparent environments, indicating that investors are better able to anticipate future earnings as transparency increases (Choi, Myers, Zang, and Ziebart 2011; Gelb and Zarowin, 2002; Lundholm and Myers, 2002). Given that *FERC* reflects the existence of transparent information that allows capital market participants to better anticipate future earnings, we expect that the same information would allow product market participants to formulate more timely competitive responses. Therefore, we expect the persistence of abnormal profits at the industry level to be negatively related to industry level transparency, as proxied by *FERC*. This possibility is consistent with the concept of proprietary costs, which features prominently in models of discretionary disclosure (e.g., Darrough and Stoughton, 1990; Feltham and Xie, 1992; Hayes and Lundholm, 1996; Verrecchia 1983, 1990; Wagenhofer, 1990).

We use *FERC* as our transparency measure rather than indicators of information from individual sources like management forecasts or conference calls. We make this choice because *FERC* encompasses all publicly available information from all sources. Competitive product market participants presumably do not constrain themselves to information from a particular source. Moreover, there is a high degree of substitutability among different information sources.

That is, two firms could have an economically equivalent amount of public information but management could be the primary source of public information for one firm while information intermediaries could be the primary source of public information for the second firm. Therefore, we require a measure of transparency that reflects all the information to which product market participants have access. *FERC* meets this requirement.

Using both cross-sectional and time series designs on a sample of industry-years from 1980 to 2012, we regress industry-level earnings persistence on the prior year's industry-level *FERC*. Consistent with our prediction, industry-level earnings persistence is negatively related to industry-level *FERC*. This finding indicates that transparency facilitates the competitive process, thereby hastening the erosion of abnormal profits. Further analysis indicates that the overall effect of transparency is concentrated in firms with abnormally low profits but not in those with abnormally high profits. This finding indicates that the primary effect of transparency is to allow firms with abnormally low profits to adapt to competitive challenges either by exposing such firms to industry best practices or by facilitating more effective monitoring of such firms. However, this effect does not directly lead to an erosion of abnormally high profits. Thus, our findings indicate that transparency does not necessarily lead to a redistribution of profits in a zero-sum sense, but can actually facilitate overall growth in an industry by contributing to the spread of best practices. Our findings add to economists' longstanding examination of the factors that affect whether profits converge to competitive levels quickly and completely (Mueller, 1986; Jacobsen, 1988; Stigler, 1963).

In supplemental analysis, we exploit the DuPont decomposition, separating ROA into profit margin and asset turnover, in order to determine whether transparency has a differential impact on the persistence of these two components of overall profitability. We find stronger

evidence that transparency is associated with lower persistence of profit margins but not of asset turnover. This finding is consistent with Soliman's (2008) argument that competition may have greater impact on profit margins than on asset turnover. Thus, transparency seems more useful in eliminating differences in profitability attributable to input and output prices, as reflected in profit margins, than it is in eliminating differences in profitability attributable to operational efficiency, as reflected in asset turnover.

We also examine whether transparency affects the sensitivity of industry-level entry and exit to changes in profit expectations for the industry. Theories of perfect competition posit that there will be greater entry into (exit from) industries with increasing (declining) profit prospects. Using industry-level establishment data from the Census Bureau, we regress the net entry into the industry in the current year on the percentage of firms in the industry that experience a subsequent improvement in ROA. We find that this association is positive, consistent with firms' entry into (exit from) industries reflecting foreknowledge of which industries have improving (or declining) profitability prospects. We further find that this association increases with transparency. This finding provides further indication that greater transparency at the industry level allows firms to respond more quickly to changes in industry conditions.

This study makes a number of contributions. First, our finding that transparency is associated with lower earnings persistence informs several research streams. Specifically, our finding informs the substantial economic literature that examines the factors that that allow abnormal profits to persist (i.e., that impede profitability convergence). Economists are interested in this issue because lack of convergence can be considered an indication of resource misallocation or disequilibrium (Brozen, 1970; Mueller, 1977). Hence, they interpret factors that facilitate the convergence process as contributing to improved product market conditions. Therefore, our

finding suggests that information transparency generally, and accounting transparency specifically, beneficially impact the product market. In addition, our finding is relevant to strategy research that also examines the factors that affect the sustainability of abnormal profits but from the perspective of managers who seek to reinforce competitive advantages (Hunt and Morgan 1995; Jacobsen 1988; McGahan and Porter 1997; McGahan and Porter 1999; Roberts 1999; Roberts and Dowling 2002; McGahan and Porter 2003; McAfee, Mialon, and Williams 2004). Finally, our finding is relevant to accounting research that examines the factors that affect earnings persistence (e.g. Lev 1983; Baginski, Lorek, Willinger, and Branson 1999; Cheng 2005), which has implications for earnings forecasting — a key fundamental analysis task.

Second, our findings that transparency about future earnings affects the natural competitive forces that govern the product market are of interest to accounting researchers. Given that the primary role of accounting information is to facilitate investment decisions, accounting researchers have largely focused on the role of accounting in the functioning of capital markets. However, our findings that accounting information has an impact on the product market indicate that the economic impact of accounting information is broader than previously acknowledged.

Third, our study provides indirect evidence related to proprietary costs. Although such costs feature prominently in theoretical models, they are challenging to document empirically. Most studies examine whether firms make disclosure decisions based on the belief that proprietary costs exist but do not provide evidence on whether product market participants actually act on available information about their competitors (Harris 1998; Berger and Hann 2007; Li 2010). Our finding that information transparency affects the persistence of abnormal profits shows that competitors act on public information about their rivals — a necessary precondition for the existence of proprietary costs.

Finally, our study provides complementary insights to Francis, Huang, Khurana, and Pereira (2009) about the effect of transparency on industry growth. While Francis et al. (2009) focus on the capital market as the channel through which transparency positively affects industry growth, our evidence suggests an additional channel. Specifically, our finding that the primary impact of transparency appears to be to facilitate profitability improvements of underperforming firms without directly eroding the profits of highly profitable firms suggests that transparency does not necessarily have a zero-sum effect wherein some firms benefit at the expense of others. Rather, transparency can contribute to overall industry growth through the spread of best practices.

The remainder of this study proceeds as follows. Section 2 discusses the related theory and develops hypotheses. Section 3 outlines the research design. Section 4 discusses the sample. Section 5 describes the empirical results, and Section 6 concludes.

II. THEORY AND HYPOTHESIS DEVELOPMENT

Product market competition and information transparency

In competitive markets, firms with abnormally high profits attract entry by other firms that offer similar products at lower prices, until all the abnormal profits disappear, while firms with abnormally low profits are either acquired by or are driven from the market by their competitors. Unless otherwise impeded, the net effect of this competitive process in the long run is that the profits of all firms in the industry converge such that both abnormally high and abnormally low profits are eliminated (Bishop 2009; Bou and Satorra 2007; Flåm 1995; Gschwandtner 2005; Jacobsen 1988; Mueller 1986; Robinson 1934; Stigler 1957; Waring 1996). Stated alternatively, the theoretical effect of competition is to lower the sustainability (i.e. persistence) of both abnormally high and abnormally low profits.

Despite the intuitive appeal of this prediction, prior research documents many real world instances in which abnormal profits persist (Mueller 1986, Waring 1996, Mueller 1977, Cheng 2005). The persistence of abnormal profits is important from a number of research perspectives. From an economic perspective, persistent abnormal profits are at odds with the notion of perfect competition, which provides the theoretical benchmark for predicting and interpreting long-run equilibria in product markets (Stigler 1957). Perfect competition is not only a theoretical but also a normative benchmark. Therefore, economists interpret violations of the central prediction of perfect competition (that abnormal profits are quickly eliminated) to be evidence of disequilibrium or misallocation of resources (Brozen 1970; Mueller 1977). On the other hand, the existence of persistent abnormal profits is desirable from a strategy perspective as it is consistent with individual managers' objective to create sustainable competitive advantages (Hunt and Morgan 1995; Jacobsen 1988; McGahan and Porter 1997; McGahan and Porter 1999; Roberts 1999; Roberts and Dowling 2002; McGahan and Porter 2003; McAfee, Mialon, and Williams 2004). From an accounting perspective, the existence of persistent abnormal profits has implications for earnings forecasting, which is a key valuation task.

Given that the existence of persistent abnormal profits has important implications, substantial research attention has been devoted to documenting the factors that impede the elimination of abnormal profits. Previously identified factors fall under the broad category of barriers to entry, which make it difficult for potential entrants to compete against the most profitable firms. Barriers to entry reflect the variety of factors that reinforce competitive advantages. These factors include regulatory or legal protections that confer exclusive rights to

resources, structural industry conditions as well as specific competencies that individual firms develop that other firms can not readily imitate.[1]

One of the most important theoretical requirements for perfect competition is that all market participants including participating firms in the product market have perfect information (e.g. Senior 1938; Nalebuff and Stiglitz 1983; Hayek 1948; Knight 1921). This requirement implicitly assumes that economic agents require information upon which to act in order to take the competitive actions that lead to profitability convergence. Economists have acknowledged how critical information is in promoting competition.[2] At the same time, they acknowledge that the theoretical ideal of perfect information may not always be met.[3] However, prior research has not examined whether variation in the degree to which this requirement is met is associated with variation in the degree to which the key prediction of perfect competition (i.e. quick erosion of abnormal profits) obtains. As Ozga (1960) asserts, "[t]he possibility, however, that…knowledge

[1] Stigler (1963) and Qualls (1974) argue that highly concentrated industries experience a slower mean convergence of profitability. Similar effects apply to R&D and advertising investment which create potential innovations and product loyalty (Roberts, 1999; Bunch and Smiley, 2001). Additionally, employees' skill level represents industry complexity, one of the main informational impediments to imitation (Mansfield, Schwartz, and Wagner 1981; Lippman and Rumelt, 1982; Mansfield, 1985; Dierickx and Cool, 1989). On the other hand, number of firms and capital intensity are normally treated as factors that expedite the convergence process because they possibly increase the market competition and the efficiency of capital utilization (Waring 1996).

[2] Mas-Colell (1998) points to perfect knowledge and market transparency as key assumptions to reach market equilibrium (p. 18). Stiglitz (1985) argues that "when one of the central pieces (the assumption of perfect information) is removed, the structure [of perfect market competition] collapses" (p. 26). Salop (1976) and Stiglitz (1989) argue that imperfect information can contribute to market power, which works against perfectly competitive outcomes. In particular, Salop (1976) argues, "because imperfect [and costly] information gives firms market power at least in the short run and often in the long run as well...the relevant market structure with imperfect information is not perfect competition but rather [close to] monopolistic competition" (p. 240). Allen (2014) points to the fact that producers undergo costly information searches to underscore the economic importance of information for product market competition.

[3] Senior (1938) states, "few capitalists can estimate, except upon an average of some years, the amounts of their own profits and still fewer can estimate those of their neighbors." Ozga (1960) claims that "[t]he fact that buyers and sellers may have only imperfect knowledge of the conditions on the market plays an important part in the economic theory of advertising" (p. 29). Similarly, Stiglitz (1985) argues that "[i]ndividuals have finite capacities to gather and process information, while communication of information between individuals is both costly and imperfect" (p. 36). Demsetz (1973) also points out that information is costly to obtain (p. 3)

may not be perfect, has never been seriously faced up to" (p. 29). We address this issue directly in this study.

We argue that transparency has the potential to impact the functioning of the product market based on the substantial evidence that transparency affects the functioning of the capital market. Specifically, prior research has shown that transparency is associated with greater liquidity, lower cost of capital, and lower stock return volatility.[4] These findings indicate that transparency enhances investors' understanding of firms' economic performance, which facilitates investment decisions by lowering investors' estimation risk. By extension, we argue that it is possible that transparency enhances product market participants' understanding of their rivals' economic performance, thereby facilitating their competitive responses.

Francis et al. (2009) find a positive relationship between transparency and the overall industry growth rate, which provides evidence that transparency does have product market implications. They interpret their finding as indicating that transparency reduces "information frictions which block capital flows to the best investment growth opportunities…" (p. 945). While they focus on how transparency affects the product market through the capital market, we consider the possibility that transparency affects the product market directly through its impact on product market participants. If product market participants act on transparent information about their rivals to formulate competitive responses, then the profits of competing firms should converge to a greater extent as industry-level transparency increases. We therefore investigate whether industry-

[4]Bhattacharya, Daouk, and Welker (2003) find country-level earnings opacity is associated with greater country-level cost of capital and lower trading in a country's stock market. Barth, Konchitchki, and Landsman (2013) extend these findings to the firm level by documenting a negative relation between firm-level cost of capital and earnings transparency. Transparency has a similar impact in the debt market as prior studies document that transparency is negatively associated with cost of debt and credit spreads and positively associated with credit ratings (Yu 2005; DeBoskey and Gillett 2013). In addition, prior studies show that transparency is associated with greater liquidity and less stock return volatility (Hutton et al. 2009; Lang and Maffett, 2011; Pagano and Röell 1996; Sadka 2011; Ng, 2011).

level transparency affects the extent to which industries achieve profitability convergence by examining the association between industry-level transparency and the persistence of profits within an industry.

Hypothesis

Competition incentivizes product market participants to take appropriate actions to eliminate both abnormally high and abnormally low profits, thereby reducing overall earnings persistence. Perfect information is a key requirement for perfect competition, which implies that economic agents require high quality information in order to take appropriate competitive actions. Information transparency likely reflects the extent to which industries conform to the theoretical ideal of perfect information. Therefore, we expect information transparency to be a determinant of the industry-level earnings persistence. We, therefore, test the following hypothesis, stated in the alternative form.

H1. Industry-level information transparency is negatively related to industry-level earnings persistence.

III. RESEARCH DESIGN

Measuring information transparency

We capture information transparency using *FERC*, which represents the extent to which current stock returns reflect foreknowledge of future earnings realizations. Prior research indicates that *FERC* is greater in more transparent environments, indicating that investors are better able to anticipate future earnings as transparency increases. Specifically, prior research has linked higher *FERC*s to more informative disclosure policies (Choi et al. 2011; Gelb and Zarowin 2002; Lundholm and Myers 2002), more transparent segment disclosures (Ettredge, Kwon, Smith, and Zarowin 2005), more transparent cash flow statements (Orpurt and Zang, 2009), and more active short-selling (Drake, Myers, Myers and Stuart 2015). As Drake et al. (2015) state, the accumulated

weight of prior research indicates that "...*FERC*s increase as more information about future earnings becomes available" (p. 751). Thus, *FERC*, measured at the industry level, is a useful summary measure of the richness of an industry's information environment.

We use *FERC* to measure information transparency rather than indicators of information from individual sources (e.g., management forecasts or conference calls) because *FERC* encompasses publicly available information from all sources. Publicly available information about a firm can come from a variety of sources including management and information intermediaries such as analysts or the press. Competitive product market participants presumably do not constrain themselves to information from a particular source. Moreover, there is a high degree of substitutability between information sources. For instance, two firms could have an equivalent amount of publicly available information but the information for the first firm could come primarily from management while the information for the second firm could come primarily from analysts. Since product market participants will use all available information from any available source, using a single source to measure the total amount of publicly available information could lead to measurement error. In the example above, for instance, basing measurement of total public information on the provision of management forecasts would lead to the first firm being classified as having more public information than the second even though they actually have an equivalent amount of publicly available information. For this reason, we use *FERC* as our transparency measure because it encompasses publicly available information from all sources, thereby facilitating over-time and cross-sectional comparisons of the amount of publicly available information about firms' future earnings.

We estimate the following regression based on Collins, Kothari, Shanken, and Sloan (1994).

$$RET_t = \alpha_0 + \alpha_1 X3_t + \alpha_2 X_t + \alpha_3 X_{t-1} + \alpha_4 RET3_t + \varepsilon_{t+1} \quad (1)$$

where:

> RET_t is the annual buy-and-hold return for the 12-month period spanning from the third month after the fiscal year-end for year t-1.
>
> X_t is income before extraordinary items-available to common, scaled by market value three months after the year t-1 fiscal year-end.
>
> $X3_t$ is the sum of income before extraordinary items-available to common for the three years following the current year (i.e., for years t + 1, t + 2, and t + 3) divided by market value (closing price x the number of shares outstanding) measured at the year t-1 fiscal year-end.
>
> $RET3_t$ are the buy-and-hold returns for the three-year period following the current year (i.e., starting three months after the current fiscal year-end).

We estimate equation (1) annually by industry, requiring at least 25 observations per industry year for reliable estimation. The coefficient on future earnings (α_1) represents our industry-year measure of transparency ($TRANS_t$).

Measuring industry-level earnings persistence

To measure earnings persistence, we estimate the following first-order autoregressive model separately for each industry-year.

$$ROA_{t+1} = a_0 + a_1 ROA_t + e \quad (2)$$

where a_1 captures the extent to which current return on assets (ROA_t) persist in the subsequent year. We estimate equation (2) annually by industry. The coefficient on ROA_t (a_1) represents our industry-year measure of earnings persistence ($PERSIST_{i,t}$). As discussed in Appendix B, we note that this measure of industry-level earnings persistence can be interpreted as capturing the convergence of profits within an industry.

Regression Models

We test our formal hypotheses using both time series and cross-sectional regression designs. We use the following regression model for our time-series tests.

$$PERSIST_{t+1} = a_0 + a_1\ TRANS_t + e \qquad (3)$$

We estimate equation (3) for each industry with at least 20 yearly observations. Equation (3) exploits variation over time in the extent of available information about future earnings but assumes that other structural factors that affect industry-level competition (e.g. barriers to entry and industry concentration) are stable over time. Coefficient a_1 captures the extent to which the sustainability of profits in year t depends on the availability of information in year t about year t+1 profits. If transparency facilitates the competitive process then we expect an industry's profits to be less persistent in years when there is greater transparency. That is, we expect greater availability of information in year t about future profits to intensify competition in year t+1, thereby leading to a faster elimination of abnormally high and abnormally low profits in year t+1 and a lower overall persistence of earnings. Thus, we expect $a_1 < 0$. We test the statistical significance of the mean and median a_1 for all industries with sufficient observations to estimate equation (3) .

We use the following regression model for our cross-sectional tests.

$$PERSIST_{t+1} = a_0 + a_1\ TRANS_t + a_2\ INTANGINTENSITY_t + a_3\ CAPINTENSITY_t + a_4\ HERF_t + e \qquad (4)$$

We estimate equation (4) yearly for all industries using weighted least squares where the weight is the number of observations used to estimate $PERSIST_{t+1}$. Coefficient a_1 in equation (4) captures whether more transparent industries have less persistent earnings. A finding that $a_1 < 0$ would support our hypothesis.

We control for various determinants of industry-level competition: intangible investment (*INTANGINTENSITY*), based on prior research that R&D and advertising expenditures contribute to unique capabilities that are hard for competitors to imitate (Bunch and Smiley, 1992; Roberts, 1999; Villalonga); capital intensity (*CAPINTENSITY*), based on prior research that capital-intensive industries are more competitive (Waring, 1996) and that earnings are less persistent in capital intensive industries (Lev 1983; Baginski et al. 1999) and the Herfindal index (*HERF*), because more concentrated industries are less competitive. See Appendix A for detailed definitions of variables. Following Fama-McBeth (1973), we determine the statistical significance of the coefficients in equation (4) based on tests of the mean of the yearly coefficients. In addition, we test the statistical significance of the median of the yearly coefficients.

IV. SAMPLE

We classify industries based on two-digit SIC codes. In addition, for each industry-year, we require the industry to have at least 25 firms with the necessary data to estimate equation (1) in order to derive a reliable industry-level transparency score for the year. These requirements result in a sample of 779 (892) industry-years from 1980 to 2012 for our time-series (cross-sectional) tests.

Panel A of Table 1 provides descriptive statistics. The mean and median are both about 0.7, consistent with previous findings that earnings are highly persistent but do not behave completely as a random walk. The mean and median of $TRANS_t$ are approximately 0.4, confirming prior findings that current returns reflect some degree of foreknowledge of future earnings. However, the interquartile range of $TRANS_t$ is 0.40, which indicates that there is also substantial variation across industries in the degree of transparency.

Panel B of Table 1 provides the mean and median levels of $PERSIST_t$ and $TRANS_t$ across years for each industry in the sample that appears at least 20 years. Industries with the highest average persistence include Apparel & Accessory Stores, Paper & Allied Products, Engineering & Management Services, and Chemical & Allied Products. Industries with the lowest average persistence include Oil & Gas Extraction, Transportation Equipment, Fabricated Metal Products, and Communications. Industries with the highest average transparency include, Apparel & Accessory Stores, Fabricated Metal Products, and Printing & Publishing. Industries with the lowest average transparency include Chemical & Allied Products, Oil & Gas Extraction, and Engineering & Management Services.

Table 2 presents correlations. $PERSIST_t$ and $TRANS_t$ are significantly negatively related ($p < 0.05$), providing initial support for our expectation that profits are less persistent in more transparent industries. We also find that persistence is significantly negatively related to capital intensity, consistent with Waring's (1996) argument that competition is less intense in more capital intensive industries and with prior empirical findings of a negative association between capital intensity and earnings persistence (Lev 1983 and Baginski et al. 1999).

V. EMPIRICAL RESULTS

Hypotheses tests

Panel A of Table 3 presents the results of our time-series hypothesis test. Consistent with expectations, the mean and median of the industry-level time-series coefficient on $TRANS_t$ is significantly negative at $p < 0.01$ (mean $\alpha_1 = -0.086$; median $\alpha_1 = -0.093$). This finding indicates that greater availability of information in year t about future earnings leads to year t earnings being less persistent in the subsequent year. This empirical finding is consistent with the idea that firms

use available information in year t to implement competitive strategies in year t+1 that erode abnormally high or abnormally low earnings in year t.

Panel B of Table 3 presents the results of our cross-sectional hypothesis test. Consistent with expectations, the mean and median of the yearly coefficient on $TRANS_t$ is significantly negative at $p < 0.01$ (mean $\alpha_1 = -0.077$; median $\alpha_1 = -0.035$). This finding indicates that earnings in year t are less persistent in industries where there is greater availability of information in year t about future earnings. This empirical finding is consistent with the idea that firms in more transparent industries are better able to implement competitive strategies in future years than firms in less transparent industries. We also find that earnings persistence is negatively associated with capital intensity, consistent with prior research (Lev 1983; Waring 1996; Baginski et al. 1999).

The results in Table 3 indicate that transparency plays an important role in facilitating the competitive forces that ultimately lead to profitability convergence. As discussed previously, transparency can lower the sustainability of abnormally high profits by providing information that facilitates competitive entry and can lower the sustainability of abnormally low profits by providing information that facilitates performance improvements for underperforming firms.[5] We examine which of these possible impacts drives our overall finding. Specifically, Panel A of Table 4 provides separate time-series tests of the effect of transparency on one-year ahead *ROA* growth for firm-years where *ROA* is above the industry median for the year and for firm-years where *ROA* is below the industry median. For firm-years where *ROA* is above the industry median, the mean and median coefficient on $TRANS_t$ are significantly positive at $p < 0.10$ but the magnitudes are modest (mean $\alpha_1 = 0.007$; median $\alpha_1 = 0.003$). For firm-years where *ROA* is below the industry

[5] For example, transparent information can provide underperforming firms with more insight about industry best practice. In addition, transparent industry-level information can provide better benchmarks for monitoring underperforming firms.

median, the mean and median coefficient on $TRANS_t$ are significant at $p < 0.01$ and are substantially larger in magnitude than the corresponding coefficients for firm-years where *ROA* is above the industry median (mean $\alpha_1 = 0.018$; median $\alpha_1 = 0.011$).

Panel B of Table 4 presents separate cross-sectional tests of the impact of transparency on one-year-ahead *ROA* growth for firm-years where *ROA* is above the industry median for the year and for firm-years where *ROA* is below the industry median for the year. For firm-years where *ROA* is above the industry median, the mean and median coefficients on $TRANS_t$ are insignificant. For firm-years where *ROA* is below the industry median, the mean and median coefficients on $TRANS_t$ are significant at $p < 0.01$ and are substantially larger in magnitude than the corresponding coefficients where *ROA* is below the industry median.

The results in Table 4 indicate that the primary effect of transparency on industry competition is to provide information that facilitates performance improvements in low performing firms. Interestingly, transparency is not associated with earnings declines for high profit firms. An implication of these combined results is that transparency does not lead to a simple redistribution of existing profits in a zero-sum game sense. Rather, transparency appears to permit underperforming firms to improve their profitability without sacrificing the profits of high performing firms. This provides an addition explanation to that offered by Francis et al. (2009) for why transparency contributes to overall industry growth.

Supplemental test of hypotheses: DuPont decomposition

To gain further insight into the drivers of our basic result, we exploit the DuPont decomposition, which separates *ROA* into profit margin and asset turnover. Profit margins are largely driven by input and prices whereas asset turnover reflects operational efficiency. Soliman (2008) argues that competition likely affects the two components of profitability differently.

Specifically, he argues that competition may have more impact on margins, which are affected by market prices, than on asset turnover, which depends on internal processes that may not be easily imitated. Therefore, transparency may likewise differentially impact the persistence or convergence of these two components of overall profitability. To explore this possibility, we first compute the industry level persistence of profit margin and asset turnover. We then reperform our time-series and cross-sectional hypothesis tests using variants of equations (3) and (4) after substituting these alternative persistence measures as dependent variables.

Panel A of Table 5 presents the time-series analyses. When persistence in profit margins is the dependent variable, the mean and median of the industry-level time-series coefficient on $TRANS_t$ are significantly negative $p < 0.01$ (mean $\alpha_1 = 0.108$; median $\alpha_1 = 0.111$). When persistence in asset turnover is the dependent variable, the mean and median cross-sectional coefficient on TRANSt are insignificant. Panel B of Table 5 presents the cross-sectional analyses. The results corroborate the time-series results. When persistence in profit margins is the dependent variable, the mean and median of the yearly cross-sectional coefficient on $TRANS_t$ is significantly negative at $p < 0.05$ (mean $\alpha_1 = 0.108$; median $\alpha_1 = 0.111$). When persistence in asset turnover is the dependent variable, the mean and median cross-sectional coefficients on TRANSt are insignificant.

Thus, the overall impact of transparency appears to be through its impact on profit margins. This finding indicates that greater availability of information in year t about future earnings leads to year t margins being less persistent in the subsequent year. This empirical finding is consistent with the idea that firms use available information in year t to implement competitive strategies in year t+1 that erode abnormally high or abnormally low profit margins in year t.

As with our analysis of *ROA*, we examine whether the impact of transparency on *ROA* components is concentrated in firm-years where the *ROA* component is above or below the industry median for that year. Specifically, Panel A of Table 6 provides separate time-series tests of the effect of transparency on one-year ahead growth in gross margin for firm-years where gross margin is above the industry median for the year and for firm-years where gross margin is below the industry median. For firm-years where margin is above the industry median, the mean coefficient on $TRANS_t$ is significantly positive at $p < 0.05$ (mean $\alpha_1 = 0.011$) and the median industry-level time-series coefficients on $TRANS_t$ is insignificant. The corresponding mean and median coefficients on $TRANS_t$ for firm-years where margin is below the industry median are also significantly positive at $p < 0.05$ (mean $\alpha_1 = 0.037$; median $\alpha_1 = 0.013$). However, the mean (median) coefficient on $TRANS_t$ for the below industry median observations of 0.037 (0.013) is about three (six) times the corresponding mean (median) coefficient on $TRANS_t$ for the above industry median observations of 0.011(0.002). Thus, the impact of transparency on margins appears to be through promoting improvement in margins for firms with below average margins rather than through eroding the margins of firms with above average margins.

Panel B of Table 6 also presents separate cross-sectional tests of the impact of transparency on one-year-ahead growth in margin for firm-years where margin is above the industry median for the year and for firm-years where margin is below the industry median for the year. The results largely corroborate those from the time series analysis. For both firm-years where margin is above the industry median and firm-years where margin is below the industry median, the mean and median yearly cross-sectional coefficients on $TRANS_t$ are significantly positive at $p < 0.05$. However, the mean (median) coefficient on $TRANS_t$ for the below industry median observations

of 0.014 (0.008) is about 1.4 (2) times the corresponding mean (median) coefficient on $TRANS_t$ for the above industry median observations of 0.01 (0.004).

Panel A (Panel B) of Table 6 also presents the corresponding time-series (cross-sectional) analysis for asset turnover. The coefficient on $TRANS_t$ is insignificant in both time-series and cross-sectional analyses for firm-years where asset turnover is above and below the industry median. These results are consistent with the findings in Table 5 that transparency has no association with the persistence of asset turnover.

The results in Table 5 indicate that the impact of transparency in reducing earnings persistence is driven largely by the gross margin component while the results in Table 6 indicate that the impact of transparency is to accelerate gross margin improvement in firms with below average margins rather than to erode the margins of firms with above average margins. By contrast, transparency has no impact on the persistence of asset turnover. These findings suggest that transparency, as reflected in *FERC*, is more effective in eliminating profitability differences due to input and output prices (as reflected in margins) than in eliminating those due to internal choices that lead to operational efficiency (as reflected in asset turnover).

Additional analysis of industry entry and exit

While the results of our hypothesis tests are consistent with transparency facilitating firms' competitive actions, we provide more direct evidence for this interpretation by examining whether transparency is associated with the sensitivity of industry entry and exit rates to changes in expected industry profits. According to the theory of perfect competition, a key manifestation of competition is the phenomenon of firms entering (exiting) industries as profitable opportunities increase (decline). As Siegfried and Evans (1994) points out, "entry decisions depend on the mechanism by which firms form expectations about future post-entry profit conditions" (p. 124).

Similarly, Kessides (1990, 1991) also find that the rate of net entry into U.S. manufacturing industries increases with industry profits. Hence, entry-exit should be related to the extent to which profit expectations for an industry change. If transparency helps firms adjust more quickly to changing profit expectations then the relation should be more pronounced as transparency increases. We test this possibility by estimating the following equation:

$$NETENTRY_{t+1} = \alpha_0 + \alpha_1 \Delta FUTUREINDROA_t + \alpha_2 \Delta FUTUREINDROA_t \times TRANS_t + \alpha_3 TRANS_t + \alpha_4 X_{t+1} + \varepsilon_{t+1} \quad (5)$$

where:

> $NETENTRY_{t+1}$ is the net expansion in establishments for an industry in year t+1 divided by the number of initial establishments based on establishment data provided by the U.S. Census Bureau. Net expansion is calculated as the number of new establishments + the number of existing establishments that expanded their work force - the number of establishment deaths - the number of establishments that contracted their work force.
>
> $\Delta FUTUREINDROA_t$ is the percentage of firms in the industry with an average ROA in years t, t+1, and t+2 that are greater than its ROA in year t-1.

X_{t+1} represents the set of control variables described in section III and in Appendix A.

$\Delta FUTUREINDROA_t$ captures the extent to which there is pervasive improvement in an industry's profit outlook. If firms' migration into or away from an industry reflects foresight about the industry's future profit prospects then we expect $\alpha_1 > 0$. If transparency facilitates firms' competitive responses then their entry-exit decisions should reflect greater foresight about an industry's future profit prospects. Therefore, we expect $\alpha_2 > 0$. Note that the sample used for this test differs from the sample we used to test our primary hypotheses because U.S. Census Bureau data use NAICS industry codes rather than SIC codes and because we have establishment data only for 1997–2010.

Table 7 presents the results of estimating equation (5). We report variants of equation (5) to demonstrate the robustness of results to the incorporation of multiple interactions. Because the inferences of our tests are the same across both specifications, we limit our discussion to the basic model with control variables included only as main effects—that is, column (4). The results are consistent with our expectations. Specifically, α_1 is significantly positive ($\alpha_1 = 0.135$; $p < 0.01$), consistent with the theory that firms' entry and exit rates reflect foreknowledge of profitable opportunities in the industry. As expected, as transparency increases, firms' entry and exit decisions reflect greater foreknowledge of profitable opportunities in the industry ($\alpha_2 = 0.191$; $p < 0.01$). These findings provide direct evidence of how competitors within an industry respond under differing levels of transparency.

VI. CONCLUSION

We examine the association between industry-level transparency and the persistence of profits within an industry. Because competition theoretically reduces overall earnings persistence by reducing the sustainability of both abnormally high and abnormally low profits, our examination sheds light on the impact of transparency on product market competition. Perfect information is a key theoretical requirement for perfect competition, which highlights the theoretical importance of high quality information in allowing firms to compete. Despite the theorized importance of transparency in promoting product market competition, prior research has not provided empirical evidence on this possibility. We provide such evidence in this study.

Based on prior research that stock returns reflect greater anticipation of future earnings in more transparent environments, we use the future earnings response coefficient measured at the industry level as a proxy for industry-level information transparency. We argue that the same information that allows capital-market participants to anticipate future earnings should also allow product market participants to identify profitable opportunities to exploit.

We find that transparency is associated with lower earnings persistence, which indicates that transparency hastens the convergence process. Supplemental analysis indicates that the overall impact of transparency is driven primarily by its role in reducing the persistence of gross margins, which reflect the impact of input and output prices. By contrast, transparency plays no discernible role in reducing the persistence of asset turnover, which reflects the internal processes that drive operational efficiency.

To bolster our interpretation that transparency facilitates competitive responses in the product market, we examine whether information transparency affects the sensitivity of industry-level entry and exit decisions to changes in industry profit expectations. We find that as transparency increases, industry-level entry and exit reflect greater foresight about the existence of future profit opportunities in that industry. This finding provides further indication that transparency at the industry level allows firms to respond more quickly to changes in an industry's profit outlook.

Our findings contribute to the extensive academic literature that examines the factors that impede profitability convergence. Moreover, our findings demonstrate that the effects of information transparency, particularly about future earnings, extend beyond the capital market to the product market.

REFERENCES

Allen, T. 2014. Information frictions in trade. *Econometrica* 82 (6):2041-2083.

Baginski, S., K. Lorek, G. Willinger, and B. Branson. 1999. The relationship between economic characteristics and alternative annual earnings persistence measures. *The Accounting Review* 74 (1):105-120.

Bain, J. S. 1951. Relation of profit rate to industry concentration. *Quarterly Journal of Economics* 65:293-324.

———. 1956. *Barriers to new competition*. Cambridge, MA: Harvard University Press.

Barro, R., and X. Salaimartin. 1992. Convergence. *Journal of Political Economy* 100 (2):223-251.

Barth, M., Y. Konchitchki, and W. Landsman. 2013. Cost of capital and earnings transparency. *Journal of Accounting & Economics* 55 (2-3):206-224.

Baumol, W. 1986. Productivity growth, convergence, and welfare - what the long-run data show. *American Economic Review* 76 (5):1072-1085.

Berger, P. G., and R. N. Hann. 2007. Segment profitability and the proprietary and agency costs of disclosure. *The Accounting Review* 82 (4):869-906.

Bhattacharya, U., H. Daouk, and M. Welker. 2003. The world price of earnings opacity. *The Accounting Review* 78 (3):641-678.

Bishop, M. 2009. *Essential Economics: An A to Z Guide, Second Edition*. New York: Bloomberg Press.

Bou, J., and A. Satorra. 2007. The persistence of abnormal returns at industry and firm levels: Evidence from Spain. *Strategic Management Journal* 28 (7):707-722.

Brozen, Y. 1970. Antitrust task force deconcentration recommendation. *Journal of Law & Economics* 13 (2):279-292.

———. 1971b. Persistence of high rates of return in high-stable concentration industries. *Journal of Law & Economics* 14 (2):501-512.

Bunch, D., and R. Smiley. 1992. Who deters entry - evidence on the use of strategic entry deterrents. *Review of Economics and Statistics* 74 (3):509-521.

Carlton, D. W. 2004. Why barriers to entry are barriers to understanding. *American Economic Review* 94 (2):466-470.

Cheng, Q. 2005. What determines residual income? *The Accounting Review* 80 (1):85-112.

Choi, J., L. Myers, Y. Zang, and D. Ziebart. 2011. Do management EPS forecasts allow returns to reflect future earnings? Implications for the continuation of management's quarterly earnings guidance. *Review of Accounting Studies* 16 (1):143-182.

Collins, D., S. Kothari, J. Shanken, And R. Sloan. 1994. Lack of timeliness and noise as explanations for the low contemporaneous return earnings association. *Journal of Accounting & Economics* 18 (3):289-324.

Darrough, M., And N. Stoughton. 1990. Financial disclosure policy in an entry game. *Journal of Accounting & Economics* 12 (1-3):219-243.

DeBoskey, D., and P. Gillett. 2013. The impact of multi-dimensional corporate transparency on U.S. firms' credit ratings and cost of capital. *Review of Quantitative Finance and Accounting* 40 (1):101-134.

Demsetz, H. 1973. Industry structure, market rivalry, and public policy. *Journal of Law & Economics* 16 (1):1-9.

Dierickx, I., and K. Cool. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35 (12):1504-1511.

Drake, M., J. Myers, L. Myers, and M. Stuart. 2015. Short sellers and the informativeness of stock prices with respect to future earnings. *Review of Accounting Studies* 20 (2):747-774.

Ettredge, M., S. Kwon, D. Smith, and P. Zarowin. 2005. The impact of SFAS no. 131 business segment data on the market's ability to anticipate future earnings. *The Accounting Review* 80 (3):773-804.

Fama, E., and J. Macbeth. 1973. Risk, return, and equilibrium - empirical tests. *Journal of Political Economy* 81 (3):607-636.

Feltham, G. A., and J. Z. Xie. 1992. Voluntary financial disclosure in an entry game with continua of types. *Contemporary Accounting Research* - 9 (- 1):- 80.

Flam, S. 1995. Learning competitive market balance. *Economic Theory* 6 (3):511-518.

Francis, J., S. Huang, I. Khurana, and R. Pereira. 2009. Does corporate transparency contribute to efficient resource allocation? *Journal of Accounting Research* 47 (4):943-989.

Gelb, D. S., and P. Zarowin. 2002. Corporate disclosure policy and the informativeness of stock prices. *Review of Accounting Studies* 7 (1):33-52.

Gschwandtner, A. 2005. Profit persistence in the 'very' long run: evidence from survivors and exiters. *Applied Economics* 37 (7):793-806.

Harris, M. S. 1998. The association between competition and managers' business segment reporting decisions. *Journal of Accounting Research* 36 (1):111-128.

Hayek, F. A. 1948. *Economics and knowledge and the meaning of competition. Individualism and Economic Order.* Chicago, IL: University of Chicago Press.

Hayes, R. M., and R. Lundholm. 1996. Segment reporting to the capital market in the presence of a competitor. *Journal of Accounting Research* 34 (2):261-279.

Hunt, S. D., and R. M. Morgan. 1995. The comparative advantage theory of competition. *Journal of Marketing* 59 (2):1.

Hutton, A. P., A. J. Marcus, and H. Tehranian. 2009. Opaque financial reports, R^2, and crash risk. *Journal of Financial Economics* 94 (1):67-86.

Ivanov, M. 2013. Information revelation in competitive markets. *Economic Theory* 52 (1):337-365.

Jacobsen, R. 1988. The persistence of abnormal returns. *Strategic Management Journal* 9 (5):415-430.

Kessides, I. N. 1990. Towards a testable model of entry: A study of the US manufacturing industries. *Economica* 57 (226):219-238.

———. 1991. Entry and market contestability: The evidence from the United States. In *Entry and market contestability: An international comparison*, edited by P. A. Geroski and J. Schwalbach: Oxford and Cambridge:Blackwell, 23-48.

Knight, F. H. 1921. *Risk, Opportunity, and Profit*. Boston, MA: Houghton Mifflin Company.

Lang, M., and M. Maffett. 2011. Transparency and liquidity uncertainty in crisis periods. *Journal of Accounting and Economics* 52 (2-3):101-125.

Lev, B. 1983. Some economic determinants of time-series properties of earnings. *Journal of Accounting and Economics* 5 (1):31-48.

Li, X. 2010. The impacts of product market competition on the quantity and quality of voluntary disclosures. *Review of Accounting Studies* 15 (3):663-711.

Lippman, S. A., and R. P. Rumelt. 1982. Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics* 13 (2):418-438.

Lundholm, R., and L. A. Myers. 2002. Bringing the future forward: the effect of disclosure on the returns-earnings relation. *Journal of Accounting Research* 40 (3):809-839.
Mankiw, N. G., D. Romer, and D. N. Weil. 1992. A contribution to the empirics of economic growth. *Quarterly Journal of Economics* 107 (2):407-437.
Mann, H. M. 1966. Seller concentration, barriers to entry, and rates of return in thirty industries, 1950-1960. *Review of Economics & Statistics* 48 (3):296.
Mansfield, E. 1985. How rapidly does new industrial technology leak out? *Journal of Industrial Economics* 34 (2):217-223.
Mansfield, E., M. Schwartz, and S. Wagner. 1981. Imitation costs and patents: an empirical study. *Economic Journal* 91 (364):907-918.
Mas-Colell, A. 1998. On the theory of perfect competition. In *Frontiers of research in economic theory: The Nancy L. Schwartz Memorial Lectures, 1983-1997*, edited by D. P. Jacobs, E. Kalai and M. I. Kamien: Econometric Society Monographs, no. 29. Cambridge; New York and Melbourne:Cambridge University Press, 16-32.
McAfee, R. P., H. M. Mialon, and M. A. Williams. 2004. What is a barrier to entry? *American Economic Review* 94 (2):461-465.
McGahan, A. M., and M. E. Porter. 1997. How much does industry matter, really? *Strategic Management Journal* 18:15-30.
———. 1999. The persistence of shocks to profitability. *Review of Economics and Statistics* 81 (1):143-153.
———. 2003. The emergence and sustainability of abnormal profits. *Strategic Organization* 1 (1):79-108.
Mueller, D. C. 1977. The persistence of profits above the norm. *Economica* 44 (176):369-380.
———. 1986. *Profits in the long run*: Cambridge; New York and Sydney: Cambridge University Press.
———. 1990a. Profits and the process of competition. In *The dynamics of company profits. An international comparison*, edited by D. C. Mueller. New York, NY: Cambridge University Press, 1-14.
———. 1990b. The persistence of profits in the united states. In *The dynamics of company profits. An international comparison*, edited by D. C. Mueller. New York, NY: Cambridge University Press, 35-58.
Nalebuff, B., and J. E. Stiglitz. 1983. Information, competition, and markets. *American Economic Review* 73:278-283.
Ng, J. 2011. The effect of information quality on liquidity risk. *Journal of Accounting and Economics* 52 (2-3):126-143.
Orpurt, S. F., and Y. Zang. 2009. Do direct cash flow disclosures help predict future operating cash flows and earnings? *The Accounting Review* 84 (3):893-935.
Ozga, S. A. 1960. Imperfect markets through lack of knowledge. *Quarterly Journal of Economics* 74 (1):29-52.
Pagano, M., and A. Röell. 1996. Transparency and liquidity: a comparison of auction and dealer markets with informed trading. *Journal of Finance* 51 (2):579-611.
Qualls, D. 1974. Stability and persistence of economic profit margins in highly concentrated industries. *Southern Economic Journal* 40 (4):604-612.
Roberts, P. W. 1999. Product innovation, product-market competition and persistent profitability in the U.S. *Strategic Management Journal* 20 (7):655-670.

Roberts, P. W., and G. R. Dowling. 2002. Corporate reputation and sustained superior financial performance. *Strategic Management Journal* 23 (12):1077.
Robinson, J. 1934. What is perfect competition? *Quarterly Journal of Economics* 49:104-120.
Sadka, R. 2011. Liquidity risk and accounting information. *Journal of Accounting and Economics* 52 (2-3):144-152.
Salop, S. 1976. Information and monopolistic competition. *American Economic Review* 66 (2):240-245.
Senior, N. 1938. *An outline of the science of political economy*. New York, NY: Farrar and Rinehart.
Siegfried, J. J., and L. B. Evans. 1994. Empirical studies of entry and exit: a survey of the evidence. *Review of Industrial Organization* 9 (2):121-155.
Soliman, M. T. 2008. The use of dupont analysis by market participants. *The Accounting Review* 83 (3):823-853.
Solow, R. M. 1956. A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70 (1):65-94.
Stigler, G. 1963. *Capital and rates of return in manufacturing industries*. Princeton, NJ: Princeton University Press.
Stigler, G. J. 1957. Perfect competition, historically contemplated. *Journal of Political Economy* 65:1-17.
Stiglitz, J. E. 1985. Information and economic analysis: a perspective. *Economic Journal* 95:21-41.
———. 1989. Imperfect information in the product market. *Handbook of Industrial Organization* 1:769-847.
Verrecchia, R. E. 1983. Discretionary disclosure. *Journal of Accounting and Economics* 5 (3):179-194.
———. 1990. Information quality and discretionary disclosure. *Journal of Accounting and Economics* 12 (4):365-380.
Villalonga, B. 2004. Intangible resources, tobin's q, and sustainability of performance differences. *Journal of Economic Behavior and Organization* 54 (2):205-230.
Wagenhofer, A. 1990. Voluntary disclosure with a strategic opponent. *Journal of Accounting & Economics* 12 (4):341-363.
Waring, G. F. 1996. Industry differences in the persistence of firm-specific returns. *American Economic Review* 86 (5):1253-1265.
Williamson, O. E. 1963. Selling expense as a barrier to entry. *Quarterly Journal of Economics* 77:112-128.
Yu, F. 2005. Accounting transparency and the term structure of credit spreads. *Journal of Financial Economics* 75 (1):53-84.

APPENDIX A
Variable definitions

Variable Name	Description
Hypothesis Test Variables	
$PERSIST_{t+1}$	industry-level earnings persistence, measured as coefficient $a_1$from estimating equation (1) annually by industry.
$TRANS_t$	industry-level information transparency for year t, measured as the industry-level future earnings response coefficient (*FERC*), which is coefficient a1from estimating equation (2) annually by industry.
Supplemental Hypothesis Test Variables	
$PERSIST\_MARGIN_{t+1}$	industry-level margin persistence, measured as coefficient $a_1$from estimating equation (1) annually by industry after substituting year t gross margin for year t *ROA* and year t+1 gross margin for year t+1 *ROA*.
$PERSIST\_TURN_{t+1}$	industry-level asset turnover persistence, measured as coefficient $a_1$from estimating equation (1) annually by industry after substituting year t asset turnover for year t *ROA* and year t+1 asset turnover for year t+1 *ROA*.
$GROWTH\_ROA_{t+1}$	$ROA_{t+1} - ROA_t$
$GROWTH\_MARGIN_{t+1}$	$MARGIN_{t+1} - MARGIN_t$ where $MARGIN_t$ = gross margin
$GROWTH\_TURN_{t+1}$	$TURN_{t+1} - TURN_t$ where *TURN* = asset turnover

APPENDIX A continued
Variable definitions

Control Variables:	
INTANGINTENSITY	intangible intensity for the industry, measured as the sum of both R&D and advertising expenditures for the industry divided by the sum of sales for the industry.
CAPINTENSITY	capital intensity for the industry, measured as the sum of depreciation expenses for the industry divided by the sum of sales for the industry.
HERF	Herfindahl Index, calculated as the sum of squared market shares based on sales for the industry.
Variables for Additional Analysis	
$NETENTRY_{t+1}$	the net expansion in establishments for an industry in year t+1 divided by the number of initial establishments, based on establishment data provided by the U.S. Census Bureau. Net expansion is calculated as the number of new establishments + the number of existing establishments that expanded their work force - the number of establishment deaths - the number of establishments that contracted their work force.
$\Delta FUTUREINDROA_t$	the percentage of firms in the industry with an average ROA in years t, t+1 and t+2 that is greater than its ROA in year t-1.

APPENDIX B

Relationship between Industry-Level Earnings Persistence and Profitability Convergence

Recall that our measure of industry-level earnings persistence is the coefficient on current *ROA* in the following first-order autoregressive model separately for each industry-year.

$$ROA_{t+1} = a_0 + a_1 ROA_t + e \quad (2)$$

In this appendix, we demonstrate that our measure of industry-level earnings persistence reflects profitability convergence, which is the key predicted outcome of industry competition. Specifically, industry level earnings persistence is consistent with the concept of beta convergence in the macroeconomic literature where per capita income growth rates of countries with initially low per capita income is expected to exceed the per capita income growth rates of countries with initially high per capital income. In the macroeconomics literature, beta convergence is estimated based on the following model

$$\Delta Y_{t+1} = \beta_0 + \beta_1 Y_t + e \quad (B1)$$

where Y is per capita country-level income. Beta convergence obtains when $\beta_1 < 0$. Beta convergence occurs as countries with initially low per capita income adopt the practices of the more successful countries and as the competitive advantages of countries with initially high per capital income are gradually eroded (e.g. Solow, 1956; Baumol, 1986; Barro and Sali-i-Martin, 1992; Mankiw, Romer, and Weil, 1992).

The concept of beta convergence can also describe industry-level dynamics. If profits within an industry follow beta convergence then firms with initially low profitability will grow more than firms with initially high profitability. Beta convergence occurs at the industry level if low profitability firms formulate responses that allow them to more effectively compete with the more profitable firms.

If one replaces Y with *ROA* in equation (B1) and estimates it by industry then β_1 captures beta convergence at the industry level. In comparing equation (2) with equation (B1), we see that earnings persistence from equation (2) is perfectly correlated with beta convergence from equation (B1). That is, lower earnings persistence (lower a_1 in equation (1)) is equivalent to higher beta convergence (lower β_1 in equation (B1)). In untabulated analyses, we conduct our hypotheses tests using industry-level beta convergence and obtain identical inferences to those using industry-level earnings persistence.

TABLE 1
Sample Description

Panel A: Descriptive Statistics

VarName	N	mean	std	q1	median	q3
PERSIST	892	0.707	0.260	0.543	0.717	0.866
TRANS	892	0.404	0.396	0.175	0.364	0.618
INTANGINTENSITY	892	0.029	0.030	0.005	0.020	0.043
CAPINTENSITY	892	0.045	0.035	0.027	0.037	0.051
HERF	892	0.090	0.067	0.052	0.073	0.105

See Appendix A for variable definitions.

TABLE 1 continued

Panel B: Mean and Median Persistence and Transparency Scores by Industry

			PERSIST		*TRANS*	
indus	**description**	**N**	**Mean**	**Median**	**Mean**	**Median**
13	Oil & Gas Extraction	31	0.58	0.63	0.18	0.20
20	Food & Kindred Products	31	0.76	0.78	0.44	0.35
23	Apparel & Other Textile Products	22	0.72	0.70	0.41	0.45
26	Paper & Allied Products	24	0.83	0.82	0.48	0.43
27	Printing & Publishing	28	0.79	0.83	0.54	0.61
28	Chemical & Allied Products	31	0.80	0.82	0.15	0.13
30	Rubber & Miscellaneous Plastics Products	24	0.72	0.71	0.35	0.40
33	Primary Metal Industries	31	0.67	0.70	0.37	0.37
34	Fabricated Metal Products	31	0.60	0.59	0.58	0.46
35	Industrial Machinery & Equipment	31	0.65	0.66	0.39	0.39
36	Electronic & Other Electric Equipment	32	0.70	0.67	0.35	0.33
37	Transportation Equipment	31	0.60	0.66	0.52	0.58
38	Instruments & Related Products	32	0.73	0.75	0.33	0.28
39	Miscellaneous Manufacturing Industries	22	0.69	0.70	0.37	0.41
48	Communications	31	0.62	0.64	0.24	0.19
49	Electric, Gas, & Sanitary Services	31	0.68	0.62	0.34	0.32
50	Wholesale Trade - Durable Goods	31	0.69	0.66	0.37	0.31
51	Wholesale Trade - Nondurable Goods	31	0.77	0.68	0.45	0.36
56	Apparel & Accessory Stores	21	0.87	0.87	0.96	0.75
58	Eating & Drinking Places	31	0.74	0.72	0.44	0.55
59	Miscellaneous Retail	27	0.76	0.80	0.37	0.39
60	Depository Institutions	31	0.67	0.80	0.41	0.36
62	Security & Commodity Brokers	25	0.64	0.71	0.45	0.37
63	Insurance Carriers	31	0.68	0.70	0.33	0.27
73	Business Services	32	0.66	0.65	0.38	0.39
80	Health Services	26	0.71	0.67	0.43	0.49
87	Engineering & Management Services	30	0.80	0.80	0.20	0.22

See Appendix A for variable definitions.

TABLE 2
Correlations

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
(1) *PERSIST*		**-0.070**	0.016	**-0.118**	-0.032
(2) *TRANS*	**-0.068**		**-0.079**	**-0.142**	0.024
(3) *INTANGINTENSITY*	0.004	-0.014		0.048	**-0.087**
(4) *CAPINTENSITY*	**-0.085**	**-0.117**	**0.239**		**0.054**
(5) *HERF*	-0.018	**0.085**	**0.059**	-0.014	

Pearson (Spearman) correlations are above (below) the diagonal. Correlations in bold are significant at the 10% level. See Appendix A for variable definitions.

TABLE 3
Test of H1: Association between Transparency and Persistence

Panel A: Summary of time-series regressions for 27 industries

Dependent Variable: $PERSIST_{t+1}$

VarName	mean	t-stat	p-value	median	signed rank test	p-value
Intercept	0.743	41.709	<.01	0.743	189	<.01
$TRANS_t$	-0.086	-3.410	<.01	-0.093	-136	<.01
N per industry	28.852			31.000		
RSQ	5.27%			3.66%		

Panel B: Summary of 32 cross-sectional regressions

Dependent Variable: $PERSIST_{t+1}$

VarName	mean	t-stat	p-value	median	signed rank test	p-value
Intercept	0.775	22.41	<.01	0.755	264	<.01
$TRANS_t$	-0.077	-2.99	<.01	-0.035	-128	0.01
$INTANGINTENSITY_t$	-0.203	-0.50	0.62	0.413	13	0.81
$CAPINTENSITY_t$	-0.604	-1.94	0.06	-0.779	-143	<.01
$HERF_t$	-0.091	-0.46	0.65	0.008	-3	0.95
N per year	27.875			28.500		
RSQ	20.91%			16.66%		

See Appendix A for variable definitions.

TABLE 4
Test of Differential ROA Growth for firms with initial ROA that is above (below) the industry median

Panel A: Summary of time-series regressions for 27 industries

Dependent Variable: $PERSIST_{t+1}$

VarName	Mean	t-stat	p-value	median	signed rank test	p-value
ROA lower than median						
Intercept	0.0018	0.93	0.36	0.0006	35	0.41
TRANS	0.0180	3.35	<.01	0.0107	140	<.01
N	28.852			31.000		
RSQ	5.96%			2.76%		
ROA higher than median						
Intercept	-0.026	-9.81	<.01	-0.027	-189	<.01
TRANS	0.007	2.43	0.02	0.003	74	0.07
N	28.852			31.000		
RSQ	5.15%			2.54%		

TABLE 4 continued

Panel B: Summary of 32 cross-sectional regressions

Dependent Variable: $PERSIST_{t+1}$

VarName	mean	t-stat	p-value	median	signed rank test	p-value
ROA lower than industry median						
Intercept	-0.003	-0.93	0.36	-0.002	-39	0.47
TRANS	0.009	2.84	<.01	0.010	150	<.01
INTANGINTENSITY	0.252	2.92	<.01	0.155	204	<.01
CAPINTENSITY	-0.116	-0.72	0.47	0.069	18	0.74
HERF	0.039	1.46	0.16	0.002	56	0.28
N	27.875			28.500		
RSQ	30.53%			28.72%		
ROA higher than industry median						
Intercept	-0.007	-3.29	<.01	-0.005	-172	<.01
TRANS	0.004	1.71	0.1	0.002	76	0.16
INTANGINTENSITY	-0.194	-6.96	<.01	-0.198	-235	<.01
CAPINTENSITY	-0.196	-3.59	<.01	-0.069	-229	<.01
HERF	-0.038	-2.45	0.02	-0.032	-146	<.01
N	27.875			28.500		
RSQ	39.72%			39.12%		

See Appendix A for variable definitions.

TABLE 5

Test of Association between Transparency and Persistence of ROA Components

Panel A: Summary of time-series regressions for 27 industries

Dependent Variable: $PERSIST\_MARGIN_{t+1}$

VarName	mean	t-stat	p-value	Median	signed rank test	p-value
Intercept	0.760	35.86	<.01	0.732	189	<.01
TRANS	-0.108	-2.91	<.01	-0.111	-105	<.01
N	28.852			31.000		
RSQ	5.73%			2.99%		

Dependent Variable: $PERSIST\_TURN_{t+1}$

VarName	mean	t-stat	p-value	median	signed rank test	p-value
Intercept	0.899	86.53	<.01	0.902	189	<.01
TRANS	0.002	0.158	0.88	0.010	12	0.78
N	28.852			31.000		
RSQ	2.88%			2.38%		

TABLE 5 continued

Panel B: Summary of 32 cross-sectional regressions

Dependent Variable: *PERSIST_MARGIN*$_{t+1}$

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	0.817	17.95	<.01	0.802	264	<.01
TRANS	-0.097	-2.17	0.04	-0.086	-120	0.02
INTANGINTENSITY	-1.180	-1.70	0.1	-0.473	-93	0.08
CAPINTENSITY	-0.320	-0.37	0.71	-0.871	-134	<.01
HERF	-0.028	-0.11	0.92	0.022	5	0.92
N	27.875			28.500		
RSQ	19.08%			14.98%		

Dependent Variable: *PERSIST_TURN*$_{t+1}$

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	0.946	53.69	<.01	0.950	264	<.01
TRANS	-0.021	-1.59	0.12	-0.038	-81	0.13
INTANGINTENSITY	-0.307	-0.86	0.4	-0.577	-179	<.01
CAPINTENSITY	-0.883	-1.46	0.15	-0.292	-95	0.08
HERF	0.040	0.36	0.72	0.004	22	0.67
N	27.875			28.500		
RSQ	27.24%			22.82%		

See Appendix A for variable definitions.

TABLE 6
Test of Differential ROA Growth for firms with initial ROA that is above (below) the industry median

Panel A: Summary of time-series regressions for 27 industries

Dependent Variable: *PERSIST_MARGIN*$_{t+1}$

Margin Below Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	0.004	0.97	0.34	0.002	7	0.87
TRANS	0.037	2.34	0.03	0.013	158	<.01
N	28.852			31.000		
RSQ	5.57%			3.01%		

Margin Above Industry Median

VarName	**mean**	**t-stat**	**p-value**	**Median**	**signed rank test**	**p-value**
Intercept	-0.028	-6.20	<.01	-0.021	-189	<.01
TRANS	0.011	2.05	0.05	0.002	65	0.12
N	28.852			31.000		
RSQ	3.90%			2.08%		

Dependent Variable: *PERSIST_TURN*$_{t+1}$

Turnover Below Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	0.017	5.04	<.01	0.014	157	<.01
TRANS	0.009	1.08	0.29	0.002	29	0.50
N	28.852			31.000		
RSQ	5.91%			3.95%		

Turnover Above Industry Median

VarName	**mean**	**t-stat**	**p-value**	**Median**	**signed rank test**	**p-value**
Intercept	-0.067	-7.74	<.01	-0.057	-186	<.01
TRANS	0.016	1.27	0.22	-0.005	19	0.66
N	28.852			31.000		
RSQ	5.05%			2.41%		

TABLE 6 continued

Panel B: Summary of 32 cross-sectional regressions

Dependent Variable: *PERSIST_MARGIN*$_{t+1}$

Margin Below Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	-0.012	-1.68	0.1	-0.015	-113	0.03
TRANS	0.014	2.20	0.04	0.008	105	0.05
INTANGINTENSITY	0.453	2.76	<.01	0.286	161	<.01
CAPINTENSITY	-0.097	-0.28	0.78	0.247	67	0.22
HERF	0.064	1.13	0.27	0.062	84	0.1
N	27.875			28.500		
RSQ	39%			38%		

Margin Above Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	-0.003	-0.97	0.34	-0.005	-66	0.22
TRANS	0.010	2.42	0.02	0.004	105	0.05
INTANGINTENSITY	-0.142	-3.52	<.01	-0.164	-171	<.01
CAPINTENSITY	-0.411	-5.50	<.01	-0.225	-253	<.01
HERF	-0.061	-2.71	0.01	-0.042	-152	<.01
N	27.875			28.500		
RSQ	41%			39%		

TABLE 6 continued

Panel B continued:

Dependent Variable: *PERSIST_TURN*$_{t+1}$

Turnover Below Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	0.010	1.87	0.07	0.007	120	0.02
TRANS	0.002	0.44	0.66	0.001	29	0.6
INTANGINTENSITY	0.123	1.12	0.27	0.242	137	<.01
CAPINTENSITY	0.062	0.50	0.62	-0.017	-54	0.32
HERF	0.053	1.86	0.07	0.062	116	0.02
N	27.875			28.500		
RSQ	21%			14%		

Turnover Above Industry Median

VarName	**mean**	**t-stat**	**p-value**	**median**	**signed rank test**	**p-value**
Intercept	-0.044	-5.14	<.01	-0.028	-256	<.01
TRANS	-0.009	-0.86	0.4	0.000	-46	0.4
INTANGINTENSITY	-0.285	-2.86	<.01	-0.278	-133	0.01
CAPINTENSITY	-0.007	-0.06	0.95	0.192	58	0.29
HERF	0.009	0.14	0.89	-0.036	-12	0.82
N	27.875			28.500		
RSQ	24%			20%		

See Appendix A for variable definitions.

TABLE 7

Additional Analysis: Association between Transparency and the Sensitivity of Entry and Exit to Anticipated Changes in Industry Profitability

	Dependent Variable: $NETENTRY_{t+1}$					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ΔFUTUREINDROA	0.203***	0.165***	0.199***	0.135***	0.318***	0.345***
	(3.891)	(3.366)	(3.850)	(2.853)	(3.217)	(4.538)
ΔFUTUREINDROA×$TRANS_{i,t}$	0.213**	0.159**	0.214**	0.191***	0.197**	0.153**
	(2.373)	(2.290)	(2.417)	(2.844)	(2.202)	(2.293)
ΔFUTUREINDROA×*INTANGINTENSITY*					-0.578	0.009
					(-0.521)	(0.011)
ΔFUTUREINDROA×*CAPINTENSITY*					-1.236	-2.647***
					(-0.990)	(-2.688)
ΔFUTUREINDROA×*HERF*					-0.339	-0.587
					(-0.443)	(-1.026)
$TRANS_{i,t}$	-0.110**	-0.079**	-0.114***	-0.093***	-0.105**	-0.075**
	(-2.582)	(-2.397)	(-2.690)	(-2.901)	(-2.476)	(-2.387)
INTANGINTENSITY			-0.096	0.182	0.166	0.168
			(-0.809)	(0.442)	(0.313)	(0.319)
CAPINTENSITY			-0.435***	-1.718***	0.146	-0.851*
			(-2.631)	(-4.730)	(0.241)	(-1.710)
HERF			0.204**	-0.110	0.364	0.054
			(2.353)	(-0.615)	(1.001)	(0.157)
Constant	-0.100***	-0.026	-0.093***	0.229***	-0.147***	0.200**
	(-4.121)	(-0.833)	(-3.605)	(2.925)	(-3.167)	(2.447)

Observations	321	321	321	321	321	321
R-squared	0.166	0.630	0.198	0.661	0.204	0.680
Adjusted R-squared	0.159	0.563	0.183	0.595	0.181	0.613
Industry FE		YES		YES		YES
Year FE		YES		YES		YES

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

See Appendix A for variable definitions.