Is Accounting Profitability Diverging? The Roles of Accounting Conservatism, Sampling Bias, and Economic Fundamentals

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Abstract

Recent empirical research has documented a substantial decrease in average accounting profitability. This paper shows that the downward trend is fully explicable by a growing profitability gap between large and small firms, especially in R&D-intensive industries. The profitability of large firms has been stable, while very small firms have lost ground. We examine the extent to which this intra-industry profitability divergence is caused by sampling bias, such as the more comprehensive coverage of firms by Compustat, and increasing accounting conservatism, such as R&D expensing and accounting accruals. Our analysis shows that, while adjusting for the inclusion of new firms and for R&D capitalization reduces divergence to some extent, economic forces are likely the main drivers of profitability divergence.

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Key Words: Profitability, Conservatism, Sampling Bias, R&D, R&D Expensing

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1 Introduction

Recent empirical research has documented a substantial decrease in average accounting profitability and an increasing incidence of negative earnings (losses) among U.S. firms. For example, the average return on equity of the firms that are included in the Compustat database has declined quite steadily from positive 10.7% in 1975 to negative 3.5% in 2002, while the percentage of firms with losses has increased from 5% in 1975 to 34% in 2002. Givoly and Hayn [2000] attribute these changes to growing accounting conservatism (in particular, larger accruals and special charges), while Klein and Marquardt [2002] argue that the role of accounting conservatism diminishes when other economic variables are included. They conclude that the secular change is partially due to macroeconomic fluctuations and partially to an increase in the number of firms in the Compustat database.

While the research in accounting shows a decline in average accounting profitability, according to national income statistics, the profitability of the corporate sector as a whole has not declined. "Corporate profits" as a fraction of national income has held quite steady, and has accounted for around 9.4% of national income on a before-tax basis. Since accounting profits are reported based on GAAP, while corporate profits in the national income statistics are based on tax returns, some differences should be expected.[1] Yet, the consistent qualitative difference in the trends of these two measures is puzzling. While accounting conservatism and economic fluctuations can create temporary differences between the two measures, what leads to a systematic difference between the two measures is not clear and merits further investigation.

A potential explanation for such a difference is a shift in the distribution of profits among firms. Corporate profits, as a national aggregate, is equivalent to a size-weighted average, while average accounting profitability, for example, in Givoly and Hayn [2000], is equivalent to an equally-weighted average. Therefore, a possible explanation for different trends in the two measures is a widening gap between the profitability of large and small firms. Supporting this conjecture, we find

[1] The national income statistics use corporate tax returns as a starting point and adjust them according to their own definition of "profits." For example, the National Income and Product Account profits are adjusted for inventory valuation and are net of stock option expenses.

that even though the equally-weighted accounting profitability measures have fallen significantly, the size-weighted averages display no significant trend. Such an observation suggests that while the accounting profitability of small firms has decreased substantially, that of large firms has remained stable. In other words, not only does a significant gap exist between the accounting profitability of large and small firms, but the gap has also increased over time. We refer to this trend as "profitability divergence by size."

The relation between firm size and profitability has been a topic of great interest to economists, since size is often viewed as the source, as well as the consequence, of market power and economic rent. For example, size is a variable of central importance in the traditional industrial organization literature, pioneered by Bain [1956], that emphasizes the structure-conduct-performance relation. Thus, large firms tend to be more profitable (which we call the "size effect"). This is probably not surprising, since a firm typically becomes large by being profitable. Nevertheless, there is nothing, once a firm becomes large, that guarantees it will stay profitable. Empirical evidence, however, does largely support the proposition that large firms are more profitable. Using accounting-based profitability measures derived from data supplied by the Internal Revenue Service, Marcus [1969] and Schmalensee [1989] find evidence of the size effect in manufacturing industries. Domowitz, Hubbard, and Petersen (DHP) [1987] show that industry-level price-cost margins are positively related to industry concentration. Interestingly, both Schmalensee [1989] and DHP [1987] document that the relation weakened over the 1958-81 period, suggesting that the market power of large firms has decreased over time. Dhawan [2001] hypothesizes that small firms are more flexible and efficient than large firms. Consistent with this hypothesis, his empirical results, which use Compustat data, show that small firms were more profitable, with, however, a lower survival rate, in the period 1970–1989. Taken together, the empirical evidence they present suggests that size does matter, but that the gap has decreased, pointing to the rise of small firms and the fall of large firms.

In contrast, our analysis indicates that the profitability gap has widened in the more recent period. In addition, we observe that the time-series pattern of a widening gap (divergence) differs across industries, reflecting differential structural changes in each industry.

The purpose of our research is to examine and identify factors that have contributed to the divergence in corporate profitability during the last three decades. The divergence in accounting profitability (of publicly traded firms) can be due to various forces such as: (1) sampling bias, (2) accounting policies, and (3) underlying economic forces. While our focus in this paper is on the first two issues, we also investigate one economic force – the increasing importance of long-term investment in PP&E and/or R&D. A full investigation of the economic forces that drive profitability divergence is beyond the scope of the present paper.

To make sure that profitability divergence is more than a statistical artifact, we examine and identify the extent to which the addition of new firms to the database has contributed to the divergence. Since IPO firms in recent years tend to be less profitable, profitability divergence could be due to the changing composition of publicly traded firms. To disentangle the impact of more inclusive coverage by Compustat, Givoly and Hayn [2000] examine a fixed set of firms that survived over all the years of their sample period, and show that these firms have also become less profitable.[2] If new listings are less profitable, and old firms have fallen in profitability, it would appear that all firms have become less profitable. Our analysis shows, however, that many firms, in particular very large firms, have been quite profitable. The "size effect" appears substantial, and, moreover, has increased in magnitude. We observe divergence in profitability in many different industries, both R&D and non-R&D intensive.

We then examine and identify the extent to which accounting policies have contributed to the divergence in corporate profitability during the last three decades. Givoly and Hayn [2000] argue that an increase in accounting conservatism, measured by higher accounting accruals and special charges, is responsible for the downward trend in accounting profitability. We find that although significantly smaller than that seen in accounting earnings, divergence in cash flow is still substantial. Thus, our analysis underscores the importance of *ex post* conservatism (Pope

[2] While this is an interesting observation, it does not show that the average firm has become less profitable. As an analogy, focusing on a fixed group of human individuals would show an increasing trend in terms of their ages, but that does not prove that a population is aging.

and Walker, 1999); it does not, however, fully explain profitability divergence.

The implication is that other forces drive profitability divergence. One important economic force is the increasing importance of long-term investment, in particular, in R&D. In many key industries in the U.S., R&D has grown increasingly important. In addition, more R&D activities are carried out by small firms. Some small firms, especially those in the pharmaceutical industry, engage almost exclusively in R&D activities that produce no immediate returns. Since R&D intensity differs across firms, how R&D expenditures are treated for reporting purposes might affect the profitability of firms differentially. In particular, expensing of R&D expenditures, which is a form of *ex ante* conservatism, could distort accounting earnings and assets of small firms more than those of large firms. Our empirical results indicate that while R&D activities contribute significantly to the observed profitability divergence, R&D accounting plays only a secondary role in explaining profitability divergence. The degree of divergence appears to be mainly determined by the industry-level average R&D intensity, rather than by firm-specific R&D intensity. R&D expensing *does* contribute to the intra-industry profitability gap between firms with different R&D intensity but of the same size. When we capitalize R&D, however, we observe no difference in profitability among firms of the same size. Within an industry, the divergence of profitability by size is independent of R&D intensity .

This paper documents differential impacts of R&D and accounting conservatism (both *ex ante* and *ex post*) on firms of different sizes. Our findings shed light on important issues in accounting research. First, several studies show that earnings response coefficients (ERC) have decreased recently (Barth, Beaver, and Landsman, 1998; Collins and Kothari, 1989; Collins, Maydew, and Weiss, 1997; Easton and Harris, 1991; Francis and Schipper, 1999; Hayn, 1995; Lev and Zarowin, 1998). The phenomenon is not surprising given the profitability divergence across firms. Since ERCs are smaller for loss firms, the increasing incidence of losses would decrease the average ERC.

Secondly, the profitability divergence documented here is an important consideration that should be taken into account in the analysis of financial statements, including ratio analysis. Several studies (Nissim and Penman, 2001, Soliman, 2003, Fairfield *et al.*, 2004) document the reversion of the profitability of individual firms to the industry average. While the profitability divergence discussed here does not contradict this phenomenon of mean reversion, it provides a richer picture. What we show is that the reversion of profitability is not simply to the industry mean, but rather to the mean in each individual firm's size group.

Thirdly, our findings suggest that empirical research that involves profitability data should take profitability divergence into account, because failing to do so might distort estimation results. For example, we expect ROA and leverage to be negatively related, as higher leverage increases the denominator. However, for some industries, such as the chemical industry (SIC code 28), one can observe a spurious positive relation between ROA and leverage. The spurious relationship is due to the fact that large firms have high profitability and leverage, while small firms have low leverage and low ROA. This spurious relation, of course, disappears when the divergence effect is taken into account. In sum, understanding the causes of profitability divergence has important implications for research on the relevance of accounting information.

We can summarize our findings as follows: (1) Divergence in profitability is not due to the increased coverage of Compustat. While newer firms exhibit lower profitability, they do not contribute much to the divergence. (2) Divergence in profitability is partially due to *ex ante* accounting conservatism. Within each R&D-intensive industry, R&D expensing is responsible for the difference in the degree of divergence between R&D-intensive and non-R&D-intensive firms. (3) Divergence is also partially due to *ex post* conservatism in capital-intensive firms, as accruals appear to have diverged among these firms. (4) To a large extent, divergence is an economic phenomenon. If the phenonmon is not economic, one would expect similar divergence among non-R&D intensive firms in R&D intensive and non-R&D intensive industries. On the contrary, we observe stronger divergence among non-R&D intensive firms in R&D-intensive industries than among non-R&D-intensive firms in non-R&D-intensive industries. Within R&D intensive industries, divergence is independent of firm specific R&D intensity after R&D capitalization. (5) Among larger firms, R&D intensity and capital intensity are primary drivers of profitability divergence. In smaller firms, however, profitability divergence cannot be explained by these two characteristics.

The remainder of the paper proceeds as follows: In the next section, we document in detail the growing gap in profitability and develop hypotheses. We specify our models in Section 3. We describe the data used in Section 4, and discuss our empirical results in detail in Section 5. We present concluding remarks in the last section.

2 Profitability Divergence and Hypotheses Development

In this section, we first define the concept of profitability divergence and then offer several competing (but not necessarily mutually exclusive) hypotheses about the factors that contribute to the divergence.

To test if profitability has diverged over time, we compare the equally-weighted (EW) average profitability measures with the size-weighted (SW) averages.[3] Panels 1A and 1B of Table 1 report, over six time periods, the averages for three accounting profitability measures and cash flows: return on equity (ROE), return on net operating assets (RNOA), return on assets (ROA), and cash flows from operations over assets (CFOA).[4] In addition, we report leverage (LEV).[5].

Panel 1A exhibits a pattern consistent with the findings in prior research (Givoly and Hayn, 2000, Klein and Marquardt, 2002, Joos and Plesko, 2005). For example, mean ROE has declined steadily from 13.3% in the 1975-9 period to 1.8% in the 1995-1999 period. Comparing Panels 1A with 1B suggests, however, that the downward trend in overall profitability is possibly driven by two different forces: the divergence in profitability itself and an increase in leverage.

Note that the downward pattern in ROE is not exhibited in the size-weighted ROE (where size is defined as total assets), except during the recession years of 2001 and 2002. Moreover, the gap between EW and SW ROE has grown over time. This widening gap between the EW and

[3]Note that different measures of size are used for different measures of profitability.

[4]We use the following definitions of profitability for year t: ROE is earnings before extraordinary items divided by beginning common equity (Compustat #18 divided by beginning common equity #60); ROA is earnings before extraordinary items divided by beginning total assets (item #18 divided by #6); RNOA is operating income after depreciation divided by beginning operating assets (total assets minus cash) (# 178 divided by #6); and CFOA is cash flow from operations divided by beginning total assets (#308 divided by #6).

[5]Leverage is defined as total liabilities divided by total assets (item # 181 divided #6)

the SW averages implies that the gap in profitability between large and small firms has increased over time (hence divergence). Since this conjecture is later to be tested empirically, we state it as a formal hypothesis (in alternative form):

> Hypothesis 1 (the divergence effect): *The difference in accounting profitability between large and small firms has increased over time.*

The downward trend in profitability measures is significantly less for SW than EW measures. However, there is still a non-trivial downward trend in size-weighted ROA, RNOA, and CFOA. The difference between ROE and these measures is that the latter three are all affected to some extent by leverage. While the leverage of small firms was essentially unchanged from 1975 to 2002, the leverage of large firms increased substantially, from 0.586 to 0.769.

To see if sampling bias plays a role, we examine whether the changes in the composition of the Compustat population have generated profitability divergence. Table 1 shows that the average number of public firms has increased from 4,236 in the years 1975-9 to 6,519 in the years 1995-9, partly because the Compustat coverage itself increased, and partly because more firms went public. In an extensive study of IPO firms, Fama and French [2004] document that: (1) the number of firms that went public increased substantially over the last three decades; (2) the dispersion in profitability of IPO firms has widened; and (3) the survival rates for these IPO firms have declined. They attribute the changes in the characteristics of IPO firms to "a sharp decline in the cost of capital," which allowed "weaker firms" and "firms with more distant expected payoffs" to go public. Thus the timing of the decision to go public is likely to have changed; firms go public at an earlier stage of their life-cycle. As a result, smaller and less profitable firms have populated the Compustat database in more recent years. Indeed Jovanovic and Rousseau [2003] report that the age of IPO firms has declined steadily since 1950. In addition, it is possible that more firms went public because the required listing standards have changed over time. For example, Nasdaq introduced a market-based listing standard in 1997, which has allowed a large number of "weak" firms to go public (Klein and Mohanram, 2004). Recall that, during the internet boom, many firms went public with only business ideas and without strong financials. Since IPO firms tend to be smaller and less profitable, the rapid increase in the number of IPOs has certainly had a large impact on firm profitability. Fama and French [2004] point out that "small new lists of 1980-2001 play an important role in the evolution of the cross section of profitability for all listed firms...."

The addition of less profitable firms could thus be the source of profitability divergence. Formally,

> Hypothesis 2 (the new firm effect): *The profitability divergence between large and small firms is due to the inclusion of new firms in Compustat.*

Our third hypothesis consists of two parts (Hypothesis 3a and 3b). We focus on the role of R&D in profitability divergence, but try to distinguish R&D activities from R&D accounting. The level of R&D activity is measured by R&D expenditures, while R&D accounting refers to how the expenditures are treated for profit calculation (i.e., how much are expensed). The National Science Foundation [2003] reports that R&D spending in the U. S. tripled (in real dollars) between 1975 and 2000, and that more and more research is being conducted by small firms. Since R&D generates returns only in the future, growing R&D-intensive firms might have to report losses or small earnings for a long time. Thus, if R&D is increasingly concentrated in small firms, a divergence of profitability can emerge solely due to the difference in the level of R&D expenditures. Therefore, we hypothesize that profitability divergence is caused by differential R&D intensity according to firm size:

> Hypothesis 3a (the R&D activity effect): *The divergence in profitability disappears after controlling for the level of R&D expenditures.*

Next, we consider how R&D accounting can influence profitability divergence. Recent accounting literature has classified accounting conservatism into two categories: *ex ante* and *ex post* conservatism. *Ex ante* accounting conservatism is prescribed by GAAP (Pope and Walker, 1999, Basu, 1997); the most notable is the expensing of R&D.

R&D expensing can reduce both earnings and assets. For a "mature" firm in a steady state, expensing has no effect on earnings but understates assets, resulting in inflated accounting profitability measures. For a "growth" firm, since R&D expensing reduces both earnings and reported assets, the net effect is unclear. Therefore, R&D expensing has a differential impact on mature firms and growth firms. If the relative numbers of mature and growth firms changed over time, then divergence in (accounting) profitability might emerge due to R&D accounting. Although accounting does not affect cash flow from operations, CFOA is inflated because of understated assets. To test this hypothesis, we construct measures of profitability under an alternative R&D accounting method, by capitalizing R&D based on the method suggested by Lev and Sougiannis [1996].

> Hypothesis 3b (the R&D accounting effect): *The divergence in profitability disappears when R&D is capitalized.*

Ex post conservatism is exemplified by a higher frequency of special charges taken by firms. We examine this issue by focusing on the difference in accounting profitability and profitability measured by using cash flows from operations. If *ex post* conservatism helps to explain the profitability divergence, we have the following hypothesis:

> Hypothesis 4 (*ex post* accounting conservatism): *The pattern of profitability divergence is different between earnings-based and cash-flows-based profitability measures.*

More specifically, if *ex post* conservatism is to account for the profitability divergence, it must be the case that smaller firms would have taken a larger and larger amount of accruals and special charges over the sample period.

3 The Models

To measure profitability divergence between large and small firms, we first need to choose the measure of size. The most common measures are market value, total assets, and sales. We use "relative sales," since sales is a more meaningful measure of size in our context; sales are used to define market share and are considered to be the source of market power.[6] In a given year, t, the relative size (RelSZ) of a firm, indexed by j, is defined as the natural logarithm of the ratio of its sales to that of the industry leader (the firm with the highest sales figure) for the previous year:

$$\text{RelSZ} = ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})\,,$$

where * represents the industry leader. In our definition, the largest firm in an industry has a relative size of 0, and all other firms have negative values as their relative size.

This definition of relative size has two important advantages. First, being a relative measure, it is independent of inflation. Secondly, and more importantly, it is independent of Compustat coverage. If the leader in an industry is public, then the relative size of all firms in the industry is fixed and does not change as more firms go public. If profitability is size-specific in an industry, then profitability differences remain the same even when more firms are added to the database, as long as the new firms have the same size-specific profitability as the old firms. Relative size is thus independent of the addition and deletion of firms in the database. That is, it is free of a sampling bias. This is not the case with other measures, for example, percentile ranking of size.

We now introduce our basic models. To test the hypotheses, we apply the same models to different profitability measures: accounting profitability measures ROE, ROA, RNOA, cash flow from operations (CFOA), and earnings based on capitalized R&D.

[6] Beginning total assets, however, are used as the denominator for other variables, such as ROA, etc.

3.1 Model I

To test hypothesis 1, we use the model:

$$\pi_{j,t} = \beta_o + \beta_1 \,\text{Tm} + \beta_2 \,\text{RelSZ}_{j,t} + \beta_3 \,\text{RelSZ}_{j,t} * \text{Tm}\,, \tag{1}$$

where $\pi_{j,t}$ is a profitability measure for firm j for calendar year t. Profitability is measured by four alternative metrics: (1) ROE, (2) ROA, (3) RNOA, and (4) CFOA. The third measure, RNOA, takes the capital structure of a firm explicitly into account: the return is defined as income before interest. Since we use 1975 as the starting point of our analysis, "Tm" is defined as a specific calendar year minus 1975 divided by ten. Thus, 1975 is set as 0 and Tm increases by an increment of .10 each year after 1975.

All profitability measures depend on the leverage of a firm, since assets deployed to generate profits are supplied by equity and debt, but expected returns will not be the same. Therefore, we use leverage as a control variable. In addition, to account for average industry effects, indicator variables for two digit SIC codes are included in all models .

Under Hypothesis 1, we expect that $\beta_3 > 0$. That is, for small firms (more negative relative size), we expect that profitability has a stronger negative trend. The value β_1 indicates the profitability trend of industry leaders, since they have RelSZ=0. Thus, for 1975 when Tm=0, the coefficient β_2 measures the disparity in profitability due to relative size in 1975. We refer to this as the "initial disparity."

The model can also be used to test Hypotheses 3b and 4. Hypothesis 3b suggests that $\beta_3 = 0$ when R&D expenditures are capitalized. Hypothesis 4 implies that $\beta_3 = 0$ for profitability measures based on CFOA. Hypothesis 3a states that if the R&D activity effect is taken into account, then profitability divergence disappears. This can be tested by adding R&D as a new independent variable in model I.

3.2 Model II

To test Hypothesis 2, we define the age of a firm as the number of years it has been included in the Compustat database. Thus, Age=0 indicates the first year a firm is in the database. An indicator variable IPO is used for the year Age=1, or the second year in the Compustat database, to proxy for the year of IPO. Matching the exact IPO dates of several companies with the Compustat database shows that Compustat often includes the financial data of IPO firms for the year prior to the IPO year. We define lnAge=ln(1+Age) and use this for measuring the new-firm-effect, as we expect the effect of age to diminish as a firm gets older. In addition, we incorporate the IPO year, as empirical evidence has shown that IPO firms tend to inflate their earnings both through accruals (Teoh, Welsh, and Wong, 1998) and real activities (Darrough and Rangan, 2005). We then measure the time trend of these effects by incorporating an interaction of lnAge and the IPO year with the time variable. The model we consider has the following form:

$$\begin{aligned} \pi_{j,t} = \beta_o \quad &+ \quad \beta_1 \,\mathrm{Tm} + \beta_2 \,\mathrm{RelSZ}_{j,t} + \beta_3 \,\mathrm{RelSZ}_{j,t} * \mathrm{Tm} \\ &+ \quad \beta_4 \, ln\mathrm{Age} + \beta_5 \,\mathrm{IPO} + \mathrm{Tm} * (\beta_6 \, ln\mathrm{Age} + \beta_7 \,\mathrm{IPO}), \end{aligned} \tag{2}$$

where π = ROE, ROA, RNOA, and CFOA (subscripts omitted).

Hypothesis 2 implies that the divergence effect, as measured by β_3, should become insignificant when we take the new-firm-effect into account. The coefficient β_4 indicates the effect of age in year 1975, when Tm = 0. A value of $\beta_4 = 0$ indicates that there is no profitability difference between new and old firms. If $\beta_4 > 0$, then we expect older firms to be more profitable than new firms in 1975. The coefficient β_5 is an indicator of earnings management by IPO firms: A positive β_5 indicates that IPO firms report higher accounting profitability, consistent with the literature on earnings management.

The coefficient β_6 indicates whether the profitability difference between old and new firms has increased over time. If $\beta_6 > 0$, it suggests that newly listed firms have become less profitable (over time) relative to older firms. The coefficient β_7 shows whether the effect on profitability of having more IPO firms in the database is increasing over time. $\beta_7 > 0$ again indicates that IPO firms exhibit higher profitability relative to non-IPO firms.

3.3 Model III

While model II is useful for understanding the effect of new listings on profitability divergence, it assumes a parametric relation between profitability and firm age. To control fully for the new-firm-effect, we also conduct a non-parametric analysis. We do so by conducting a separate analysis for firms in each age cohort; cohort is assigned to each firm based on its IPO year.[7] For firm j in industry i, which belongs to the age cohort g in a given calendar year t, we estimate the following model:

$$\begin{aligned} \pi^{g,t}_{j,i} &= \beta^{g,t}_{o,i} + \beta^{g,t}_1 \text{LEV}_{j,i} + \beta^{g,t}_2 \text{RelSZ}_{j,i} + \beta^{g,t}_3 \text{R\&D}_{j,i} + \beta^{g,t}_4 \text{R\&D} * \text{RelSZ}_{j,i} \\ &\quad + \beta^{g,t}_5 \text{PP\&E}_{j,i} + \beta^{g,t}_6 \text{PP\&E} * \text{RelSZ}_{j,i} + \beta^{g,t}_7 \text{IPO}, \end{aligned} \tag{3}$$

where LEV, R&D and PP&E indicate leverage, R&D intensity (R&D/Assets), and capital intensity (PP&E/Assets). Note that t is the same as Tm. The model is estimated independently for each age cohort g in each year t. If profitability divergence is due to lowered IPO criteria, then we should observe no divergence when we require all firms to have the same IPO year. This implies that in the model:

$$\beta^{g,t}_k = \beta_{k,o} + \beta_{k,1} \cdot t, \qquad k = 1, ..., 7, \tag{4}$$

we should observe $\beta_{k,1} = 0$. For k=1,2,3,5,7, $\beta_{k,1} > 0$ indicates that profitability of firms diverges with leverage, size, R&D intensity, capital intensity, and the IPO year. For k=4, 6, $\beta_{k,1} > 0$ indicates that the divergence of profitability between small and large firms differs according to R&D intensity and capital intensity. For example, if $\beta_{4,1} > 0$, profitability divergence according to size is more pronounced among firms with higher R&D intensity.

[7] The age cohort is based on each 5-year period starting in 1975. All firms that went public before 1975 are placed in a separate cohort.

While it is possible to combine equations (3) and (4), this would lead to a model with nearly 8,000 dummy variables (by industry, year, and age) at the two-digit SIC level. We therefore present the results of our estimation using the two equations separately. If we were to conduct estimation industry by industry, such a combination is feasible, since the number of dummy variables is manageable (more than 100, however). In such a case, we would estimate the following model for each industry:

$$\begin{aligned}\pi_{j,i}^{g,t} \;=\; & \beta_{o,i}^{g,t} + \beta_{1,o}\,\mathrm{LEV}_{j,i} + \beta_{2,o}\,\mathrm{RelSZ}_{j,i} + \beta_{3,o}\mathrm{R\&D}_{j,i} + \beta_{4,o}\mathrm{R\&D} * \mathrm{RelSZ}_{j,i} \\ & + \beta_{5,o}\mathrm{PP\&E}_{j,i} + \beta_{6,o}\mathrm{PP\&E} * \mathrm{RelSZ}_{j,i} + \beta_{7,o}\mathrm{IPO} \\ & + \{\, \beta_{1,1}\,\mathrm{LEV}_{j,i} + \beta_{2,1}\,\mathrm{RelSZ}_{j,i} + \beta_{3,1}\mathrm{R\&D}_{j,i} + \beta_{4,1}\mathrm{R\&D} * \mathrm{RelSZ}_{j,i} \\ & + \beta_{5,1}\mathrm{PP\&E}_{j,i} + \beta_{6,1}\mathrm{PP\&E} * \mathrm{RelSZ}_{j,i} + \beta_{7,1}\mathrm{IPO}\,\} * t. \qquad (5)\end{aligned}$$

The models considered here are designed to estimate the trend and divergence in profitability. An alternative specification is to use changes in profitability, which can be modeled by including lagged profitability. A negative trend in profitability implies a negative intercept in a change model. The intercept, however, is often confounded with the mean of independent variables, and therefore is more difficult to interpret. While we do not present the tests using change models, we perform such an analysis for robustness. The results are consistent with the trend models below.

4 Data

The sample starts with all firms from the Compustat 2002 database in the primary, secondary, and tertiary, full coverage and research files. In order to measure profitability meaningfully, we require all firms to have total assets, net operating assets, book value of equity, and total sales of at least \$1 million each, since these variables are used in the denominators. Furthermore, we delete one percent of extreme observations at both ends from each year.

We focus on the sample period 1975 to 2002 for three reasons. First, even though some divergence in profitability appears before 1975, we wish to avoid the effect of the inception of NASDAQ. If the firms on NASDAQ display different profitability from the existing firms, including the year 1974 may induce either a profitability trend or a pattern of divergence after 1974. Excluding data before 1975 reduces the effect of change in market coverage. Secondly, we choose 1975 because SFAS 2 (Accounting for Research and Development Costs) went into effect on 1/1/1975. Starting from 1975 SFAS 2 provides a common base for comparing all companies. The third reason for starting in 1975 is that the variable needed to compute cash flows from operations (item #110) did not exist prior to 1970.

5 Descriptive Analysis

We first summarize the time trend of various profitability measures. Panel 1A shows that all equally-weighted (EW) profitability measures have steadily declined. For example, the average ROE declines from 0.133 in the 1975-9 period to 0.018 in the 1995-9 period, and becomes negative during the recession period of 2000-3. The decline is the smallest for CFOA (cash flows from operations over beginning total assets). However, if we subtract 0.05 (roughly the depreciation expense as a fraction of total assets; see Thomas and Zhang, 2000) from CFOA, we observe a similar pattern. Leverage appears constant. The number of firms has increased in general, albeit with cyclical fluctuations.

The decline, if any, is much more gradual for size-weighted profitability measures in Panel 1B. ROE, which is more neutral to changes in leverage, is nearly constant except during the recession period 2000-3. This is in contrast to the average ROE in Panel 1A. The weighted average is equivalent to the sum of profits of all firms divided by the sum of the corresponding divisor. For example, the size-weighted ROE represents aggregate earnings divided by the aggregate equity. In this calculation, therefore, large firms are assigned higher weights than small firms. The contrast between the declining trend in Panel 1A and the lack of trend in ROE in Panel 1B leads us to infer that ROE of large firms has remained stable or increased in the sample period, while ROE of small firms has decreased. Thus, we conclude that there is a divergence in ROE for firms of different sizes.

In Panel 1B, ROA still shows a declining trend, although less so than in Panel 1A. This is potentially because SW leverage increased substantially from 1975 to 2003. Note that leverage in Panel 1A remains nearly constant. This suggests that the leverage of large firms has increased, while the leverage of small firms has remained constant. An increase in leverage naturally decreases the mean ROA as common equity comes to represent a smaller portion of total assets. Therefore the downward trend in ROA may be induced simply by the higher mean leverage. A greater decrease can be seen in CFOA.

RNOA, defined as operating income over net operating assets, measures the operating profitability of a firm and is relatively free from the effect of leverage. In Panel 1B, we observe a slightly decreasing trend, although one substantially weaker than the corresponding column in Panel 1A. Empirically, RNOA is not completely independent of leverage, and is actually negatively related to leverage.

To understand the divergence in profitability (ROE and ROA) by size, we analyze the average profitability of firms based on their size (Table 2). Firms are first partitioned into five relative size groups in their respective industries and then sorted into non-R&D and R&D-intensive groups based on their R&D intensity level (with a cutoff of R&D/Assets at 0.01). The five relative-size groups are labeled Largest, Large, Middling, Small, and Smallest. For each industry, "Largest" includes all firms with sales more than half of that of the industry leader; "Large" includes firms with sales between one-tenth to half; "Middling" is from one-hundredth to one-tenth, "Small," from one-thousandth to one hundredth, and "Smallest," less than one-thousandth of that of the industry leader. Table 2 provides the average sales of firms in each group.

Table 2 illustrates the divergence of (EW) average profitability (ROE and ROA) of each size group. We conduct an analysis separately for R&D-intensive firms (R&D/Assets$\geq$0.01) and non-R&D-intensive firms (R&D/Assets < 0.01). Panels 2A and 2B show the trend for ROE, which is free from the effect of leverage change. In both panels, we observe in the earliest five-year period (1975-9) a relatively similar profitability for firms of different sizes, with the difference of $0.143 - 0.105 = 0.038$ between Largest and Smallest firms for non-R&D-intensive firms and $0.149 - 0.11 = 0.039$ for R&D-intensive firms. During the period 2000-3, this difference, however, increases to $0.091-(-0.173) = 0.264$ and $0.114-(-0.309) = 0.423$, respectively. This confirms our conjecture about profitability divergence. The divergence occurs nearly uniformly across different size groups except in the R&D-intensive Largest and Large groups.

Panels 2C and 2D provide the average ROA for each size group.[8] We observe a similar profitability divergence according to size. However, unlike ROE, there is a slight decreasing trend in the ROA of Largest firms. This is due to an increase in the leverage of Largest firms as discussed above.

Table 3 provides descriptive statistics of the variables we use in our regression. In addition to the profitability measures we discussed so far, we create two new measures, ROA* and CFOA*, based on the R&D capitalization rule proposed in Lev and Sougiannis [1996]. Using this rule, for ROA*, R&D expenditures are added back to and the amortized portion is subtracted from earnings; any unamortized R&D expenditures are added to assets. For CFOA*, we assume that all R&D expenditures are cash and are added back, since they are reclassified as cash outflows in investing activities.

5.1 Hypothesis Testing

In this section, we discuss the empirical findings about the hypotheses of Section 2. In presenting our results, we focus on ROA and CFOA as the profitability measures. Following Givoly and Hayn

[8] To be consistent with Givoly and Hayn [2000], we use ROA as the primary measure for analysis in the rest of the paper.

[2000], ROA is defined as income before extraordinary items divided by beginning total assets. This definition of ROA allows us to make inferences about accruals easily, since the difference between ROA and CFOA results from accruals.[9] We first summarize the results as follows:

1. We formally confirm that there is a profitability divergence by size even after controlling for the effect of leverage, supporting Hypothesis 1. For Largest firms, there is virtually no downward trend in profitability after controlling for leverage.

2. Divergence does not disappear even after controlling for the new-firm-effect, rejecting Hypothesis 2.

3. Profitability divergence in CFOA of small firms remains highly significant. Divergence in profitability among large firms disappears when we look at cash flows from operations instead of earnings, supporting Hypothesis 4 on accounting conservatism. However, further analysis (in the next subsection) indicates that this is due to capital intensity.

4. Capitalizing R&D does not eliminate (or even decrease) divergence, rejecting Hypothesis 3b.

Panels 4A and 4B of Table 4 report the estimates of the three models for two size groups: "Group L" and "Group S".[10] Group L includes all firms with sales of more than 1% of those of corresponding industry leaders (Middling, Large, and Largest goups), while Group S includes the Small and Smallest groups. For simplicity, we refer to a firm in Group L as a Group L firm and a firm in Group S as a Group S firm. Table 2 shows the size of firms in each group. We perform separate analyses for the two groups, as Table 2 suggests that profitability divergence is weaker among Group L firms.

When interpreting regression results where interaction terms are involved, it is necessary to take into account the coefficients on both the higher order interactions and the lower order variables. To illustrate, consider the variable Tm in Panel 4A of Table 4. Tm by itself has a negative and significant coefficient for model II and II'. If one infers that profitability evinces a

[9] As robustness studies, we perform our analyses using both ROE (earnings before extraordinary items over beginning common equity) and RNOA (operating income after depreciation over net operating assets [total assets less cash]). Overall, the results based on ROE and RNOA are similar to those from ROA.

[10] We partition firms into two groups, since using five groups would increase the number of tables to an unmanageable level.

negative trend, the inference is incorrect. One needs to consider the interaction terms of Tm with other variables (i.e., relative size (RelSZ), age (lnAge), and IPO). For example, to find the profitability trend of the industry leader in each industry, first we need to take into account the fact that they have RelSZ=0, and are typically neither new IPO nor young firms (so that IPO=0 and lnAge is large). If we use the 90% percentile for lnAge, then lnAge=3.5. Thus in model II' for ROA, the profitability trend of the largest firms is $(-0.017 + 0.005 * 3.5) = 0.0005$, which is slightly positive. This shows that the ROA of industry leaders does not have a negative trend.

Panel 4A shows that for ROA for Group L firms, the coefficient on Tm*RelSZ in Model I (coef=0.003, t=10.9) is positive and significant. This indicates that the profitability of relatively small firms within this group has decreased over time since their RelSZ is more negative. Divergence is even steeper among Group S firms; the coefficient is more positive (coef=0.02, t=39.2) for Tm*RelSZ in Panel 4B.

When we switch the profitability measure from ROA to CFOA in Panel 4A, we observe that the coefficient on Tm*RelSZ decreases to 0.000 (t=0.5). This indicates that the divergence in profitability of Group L firms is explainable entirely by the effect of accounting accruals. For Group S firms, the coefficient on Tm*RelSZ also decreases substantially when CFOA is used, from 0.020 (t=39.2) to 0.014 (t=30.0). Therefore, for S Group firms, accounting accruals appear to be responsible for about one-third of the profitability divergence. The results from both Group L and S firms are consistent with Hypothesis 4. However, further analysis below indicates that profitability divergence here is likely due to depreciation expense. Therefore, *ex post* accounting conservatism is unlikely to be the explanation.

Model II includes variables designed to incorporate the effect on profitability divergence of new firms: firm age (in terms of lnAge=ln(1+Age)) and the IPO indicator. The effect is allowed to change linearly over time by the interaction of these variables with time. For ROA of Group L firms, the coefficient on Tm*RelSZ drops slightly, from 0.003 (Model I) to 0.002 (Model II), but remains significant. Therefore, the divergence effect cannot be fully explained by the new-firm-effect; we therefore reject Hypothesis 2. For Group S firms (Panel 4B), after the firm-age related variables are added, the coefficient on Tm*RelSZ decreases marginally from 0.020 to 0.019, which remains highly significant. Thus, we cannot completely explain divergence by the addition of new firms to the Compustat database, in contradiction to Hypothesis 2.

The coefficients on the firm age-related variables display an interesting pattern. For all regressions in Table 4, the coefficients on lnAge and IPO are either negative or insignificant, indicating that new firms were more profitable than older firms in 1975 (when Tm=0). The coefficient on Tm*lnAge, however, is highly positive. For model II with ROA in Panel 4A, the coefficient is 0.005 (t=11.0). This indicates that the new-firm-effect has been increasing over time, so that by 2003 (Tm=2.9), the coefficient on lnAge is $-0.008 + 0.005 * 2.9 = 0.065$. For Panel 4B the coefficient on lnAge increases from -0.020 (t=22.3) in year 1975 to $-0.020+0.023*2.9 = 0.047$ in 2003. This indicates that firms newly listed in recent years are less profitable, which is consistent with the results of Fama and French [2004].

Based on model II in Panel 4A, we find that the coefficient on Tm*IPO is positive and highly significant for the ROA regression (coef=0.017, t=8.5), but not for the CFOA regression (coef=0.001, t=0.6). This suggests that IPO firms show higher accounting profitability than comparable firms, but do not have higher cash flows. That is, the higher ROA of IPO firms is entirely due to higher accruals; this is consistent with the literature on IPO earnings management (Teoh, Welsh, and Wong, 1998).

Model II' includes R&D expenditures as an additional variable. For ROA, the inclusion of R&D does not significantly decrease divergence as measured by the coefficient on Tm*RelSZ. From model II to model II', the coefficient remains at 0.002 in Panel 4A, but decreases from 0.019 to 0.017 in Panel 4B. Since they are all significant, it is unlikely that the increase in the number of less profitable firms is due to the low profitability of R&D-intensive firms, in contrast to Hypothesis

3a. The relationship between R&D intensity and divergence is studied more extensively below.

The coefficient on R&D in Panel 4A is negative (-0.105, $t = 7.7$) for ROA, but is positive for CFOA (0.116, t=7.1). This indicates that firms with high R&D have slightly lower accounting profitability, but greater cash flow from operations.[11] The low magnitude of the coefficient indicates that R&D expensing does not create a great disparity in profitability between R&D-intensive and non-R&D-intensive firms among Group L firms. Capitalizing R&D would make the profitability (ROA*) of R&D-intensive firms slightly higher (coef=0.066, t=5.0) than that of non-R&D-intensive firms.

The results are different for Group S firms. The coefficient on R&D for ROA in Panel 4B is substantially more negative (coef=-0.414, t=47.9). This negative coefficient nearly disappears with R&D capitalization (coef=-0.022, t=2.7). This indicates that R&D expensing leads R&D-intensive small firms (which are potentially growth firms) to report lower profitability than non-R&D-intensive small firms. On average R&D capitalization eliminates this difference.

Except for the coefficient on R&D, the results for ROA* and CFOA* are very similar to those for ROA and CFOA. For Group L firms, the coefficient on Tm*RelSZ remains essentially unchanged between ROA and ROA*, and between CFOA and CFOA*. For S Group firms, the coefficient on Tm*RelSZ decreases only slightly. This suggests that mandating capitalization of R&D would not substantially decrease divergence.

The coefficient on the time variable, Tm, is negative for models II and II' for Group L firms (Panel 4A). This coefficient indicates the profitability trend of a hypothetical firm with age=1 and RelSZ=0. In fact, firms with RelSZ=0 are industry leaders in each industry and tend to be older firms. Thus, the actual profitability trend of the industry leader can be represented by the coefficient on Tm, plus lnAge, multiplied by the coefficient on lnAge*Tm.

[11] This is likely due to the amortization of intangible assets, which results from acquisitions, even though R&D is not capitalized.

5.2 Further Analysis of R&D and Capital Intensity

While Table 4 provides useful information about the changing effect of firm age, the specific functional form we used is based on a strong assumption. To relax this assumption and to control for the effect of new IPO firms fully, we next perform an analysis based on each age cohort using model III in Section 3. The age cohort is based on each 5-year period starting in 1975, and all firms that went IPO before 1975 are placed in a separate cohort. The regression is performed each year for each age cohort, with dummy variables for industries based on the two-digit SIC codes.[12] To analyze the level and trend of each coefficient, we run a weighted regression of the coefficient against time as in equation (4): $\beta_k^{g,t} = \beta_{k,o} + \beta_{k,1} \cdot t$. The regression is weighted by the estimation precision of $\beta_k^{g,t}$. This method can be considered an extension of the Fama-MacBeth regression.

Panels 5A and 5B of Table 5 show the estimation results for the reduced model (using only leverage, relative size, and IPO), and for the full model with the R&D effect (R&D), capital intensity (PP&E), and their interaction with size. As in Table 4, the results are presented for Group L and S firms separately.

Panel 5A shows that for Group L firms, the divergence in ROA in Table 4 is due to profitability divergence among R&D and capital-intensive firms. In other words, for firms with low R&D and low PP&E, divergence in ROA and CFOA is similar. In the reduced model, the coefficient on relative size (RelSZ) displays an increasing trend in the case of ROA (coef=0.002, t=6.43) but not in the case of CFOA (coef=0.000, t=0.10), similarly to what we observe in Table 4. In the full model, in which R&D and capital intensity are included, the trend in the coefficient on RelSZ becomes negative (coef=-0.001, t=2.45) for ROA. This suggests that for Group L firms, the divergence in ROA is explainable by the effects of R&D and capital intensity.

For Group S firms (Panel 5B), in both the reduced and the full model, the divergence coef-

[12]Note that in this analysis, the new firm effect is fully absorbed by the intercept of the regression.

ficients are positive and highly significant. The estimates are approximately the same for both ROA and CFOA, and are not affected by the inclusion of R&D and PP&E.

Findings from Table 5 suggest that the different degree of divergence between ROA and CFOA for Group L firms is due to the divergence among firms with high R&D and/or high capital intensity. In the next section, we investigate the impact of R&D and capital intensity on profitability divergence.

For large and mature firms, which are more likely to be in a steady state, R&D expenditures are approximately equal to the amortization cost when R&D expenditures are capitalized. Expensing has, therefore, little effect on earnings, but it does reduce the asset base. Our intuition suggests that large R&D-intensive firms would tend to have higher ROA and CFOA than comparable non-R&D-intensive firms (e.g., firms with investment in PP&E). In Panel 5A, we find that for ROA, the estimate of "Initial" of R&D is negative (−0.382, t=5.29), indicating that our intuition does not hold in 1975, the first year that SFAS 2 became effective. However, the trend coefficient (0.266, t=6.24) indicates that the R&D-intensive Group L firms generated higher ROA over time than those with little R&D. By year 2003 (t=2.9), the R&D coefficient on Group L firms is $-0.382 + 0.266 * 2.9 = 0.389$, suggesting that R&D-intensive firms have significantly higher ROA than non-R&D-intensive firms of comparable size.

For R&D-intensive growth firms, it is likely that their R&D expenditures would exceed the amortization cost (if capitalized). Therefore their earnings are negatively impacted by R&D expensing, so that they might show a lower accounting profitability than comparable non-R&D-intensive firms. In the full model, Panel 5A, a firm in 1975 (t=0) with relative size RelSZ = $ln(1/100) = -4.605$ has a combined R&D coefficient of $-0.382 + (-4.605) * (-0.134) = 0.235$, indicating that Group S firms indeed have a higher ROA than comparable non-R&D-intensive firms. The trend of R&D*RelSZ, however, is positive, indicating that the ROA of smaller (in Group L) R&D-intensive firms has decreased over time. By 2003, for Group L firms, the combined coefficient on R&D is $(-0.382 + 0.266 * 2.9 + (-0.134) * (-4.605) + 0.093 * (-4.605) * 2.9 =)$-0.235, indicating that smaller (in Group L) R&D-intensive firms have much lower ROA than comparable non-R&D-intensive firms.

For R&D-intensive firms in Group S, ROA has declined in a similar manner to smaller R&D-intensive firms in Group L (note that all firms in Group S are smaller than firms in Group L). However, ROA does not seem to diverge further by size among Group S firms. For the largest firms in Group S (RelSZ=$ln(1/100)$=-4.605), the effect of R&D in 1975 (t=0) is $0.922 + 0.117 * (-4.605) = 0.383$, indicating that R&D-intensive firms have higher ROA than non-R&D-intensive firms. By 2003 (t=2.9), the effect of R&D has become $0.922 + (-0.284) * 2.9 + 0.117 * (-4.605) + 0.009 * 2.9 * (-4.605) = -0.561$, indicating just the opposite. This pattern is consistent with the results for Group L firms.

In summary, the results indicate that profitability divergence by size is larger among R&D-intensive firms than non-R&D-intensive firms ("the R&D activity effect"). While small R&D-intensive firms had higher ROA than comparable non-R&D-intensive small firms in 1975, this initial disparity has been reversed during the last three decades. R&D-intensive firms in 2003 have much lower ROA than non-R&D-intensive firms. This remains true even after we control for the new-firm-effect and the effect of leverage.

An important question is whether the higher divergence in ROA of R&D-intensive firms is caused by R&D expensing. We repeat our analysis above with ROA* and CFOA* in Panels 5A and 5B. The divergence in ROA is nearly identical. This implies that R&D capitalization with a uniform capitalization rule, as used in Lev and Sougiannis [1996], would *not* eliminate the higher divergence in profitability of R&D-intensive industries. The divergence is likely to be caused by economic forces that are at work in R&D-intensive firms (e.g., economies of scale) and scope. The estimate of divergence can be reduced only if we allow a higher capitalization rate for smaller R&D-intensive firms.

Our results also indicate that the divergence in ROA between large and small firms is higher for capital-intensive firms than for non capital-intensive firms. The coefficients on capital-intensity variables (PP&E) in both Panels 5A and 5B have similar signs to those of the R&D variables, although their magnitude and significance are not quite the same. We draw, however, similar conclusions that such divergence in profitability is likely due to the economies of scale enjoyed by capital-intensive firms.

The coefficient on the IPO variable is unchanged from what is observed in Table 4. IPO firms tend to have higher earnings, and somewhat higher CFOA relative to their peers. The coefficient on IPO evinces a positive trend for both Group L firms (coef=0.00046, t=2.64) and Group S firms (coef=0.002, t=5.40), indicating that IPO firms had higher ROA and the gap increased over time. The trend is less positive for CFOA, except for Group S firms, which have a coefficient estimate of 0.001 (t=3.52).

The results in this subsection can be summarized as follows:

1. Controlling for the joint effects of firm age, time, and industry for Group L firms, we observe no divergence in either ROA or CFOA for firms with low R&D and those with low capital intensity. For Group S firms, (with-in-group) divergence by size is highly significant. However, this divergence is not due to accounting accruals.

2. There is a larger profitability divergence by size in R&D-intensive and capital-intensive firms than in non-R&D-intensive and non-capital-intensive firms.

3. Divergence in high R&D-intensive firms cannot be reduced by the uniform R&D capitalization rule of Lev and Sougiannis [1996].

5.3 Industry Analysis

We now conduct our analysis at the industry level. This provides additional insight into the forces that drive the divergence of accounting profitability. As above, the model controls for the joint effects of year and age cohort, as described in model III in section 3. Analysis at the industry level is also more efficient and avoids the two-stage regression in Table 5. However, we do not separate the sample into L and S groups as in Table 5, to avoid the possibility of further complicating interpretation.

In Tables 6-8, we present the estimation results of the reduced models for R&D-intensive and non-R&D-intensive industries.[13] Results for the five largest industries of each type (based on the total number of observations) are presented separately, with all other industries as "Others." The five largest R&D-intensive industries are SIC code 28 (chemicals and allied products), SIC 35 (industrial machinery and equipment), SIC 36 (electrical and electronic equipment), SIC 38 (instruments and related products), and SIC 73 (business services). The five largest non-R&D intensive industries are SIC 13 (oil and gas extraction), SIC 20 (food and kindred products), SIC 48 (communications), SIC 49 (electric, gas, and sanitary services), and SIC 50 (wholesale trade–durable goods).

In Panels 6A and 6C, the estimated coefficient on the time variable indicates that there is a significant downward trend in ROA in every industry. The steepest downward trend is observed in SIC code 73 (Business services), with a coefficient of −0.08 (t=29.39), and the most gradual is observed in SIC code 49 (electric, gas, and sanitary services), with a coefficient of −0.011 (t=19.35).

Panels 6B and 6D show that the downward trend observed in Panels 6A and 6C is due to the divergence of ROA by size. Without exception, the coefficient on the variable Tm*RelSZ is positive and significant (at the 1% level) for all industries, showing that smaller firms have a lower ROA in more recent years. This finding indicates that profitability divergence occurred in every industry during the last three decades.

The results also indicate that divergence in ROA is much higher in R&D-intensive industries. The average coefficient on Tm*RelSZ is 0.018 (not tabulated) for the five largest R&D-intensive

[13] To partition industries into R&D-intensive and non-R&D-intensive industries, we use R&D/Assets=0.005 as the cut-off point. Earlier in Table 2, we classified each firm as R&D-intensive or non-R&D-intensive by using a higher standard of R&D/Assets=0.01. This is because some firms in R&D-intensive industries might not engage in much R&D activity.

industries, compared to 0.007 (not tabulated) for the five largest non-R&D-intensive industries.

In contrast to that of small firms, the ROA of industry leaders (RelSZ=0) does not display any downward trend. With the size effect taken into account, the time variable, Tm, has a positive coefficient in all but one industry in Panels 6B and 6D. This suggests that for the largest firms, ROA has either increased or remained stable.

In Tables 7 and 8, we present estimates of the full model, allowing us to evaluate the hypotheses of Section 2 at the industry level. In Table 8, we do not report results with R&D capitalization, since R&D is too small for capitalization to make any difference among firms in these non-R&D-intensive industries.

Table 7 shows the estimated coefficients for the intermediate and the full models. The intermediate model does not include any interaction of relative size and IPO, R&D, and capital intensity, while the full model incorporates interactions of these variables. This allows us to identify the differential degree of divergence among firms with different R&D and capital intensities within each industry.

For R&D-intensive industries, Panel 7A indicates that divergence in ROA remains positive and significant (at 5%) for all industries in both the intermediate and the full models. Across the five largest industries, the average coefficient on Tm*RelSZ is 0.010 (untabulated) for the intermediate model, and 0.012 (untabulated) for the full model. For non-R&D-intensive industries, the coefficient on Tm*RelSZ is positive and significant (at 5%) for one industry (SIC=48) in Panel 8A, and positive but insignificant for other industries. Overall, we show that, within many industries, divergence in ROA exists even for firms with low R&D and low PP&E.

Our results, nevertheless, suggest that, to a large extent, divergence of ROA is an industry effect, rather than a firm-specific effect. This is relevant, for example, in the case of a non-R&D-intensive firm in an R&D-intensive industry. Since substantial variation exists in R&D intensity among firms within the same industry, an R&D-intensive industry can include non-R&D-intensive

firms. Divergence is determined by the nature of the industry, and not by whether a particular firm is R&D intensive. Thus, divergence in ROA is substantially higher for all firms in R&D-intensive industries (as indicated by the average coef=0.010 of the five largest industries) than for firms in non-R&D-intensive industries (in which the average coef= 0.004). Note that in the case of these non-R&D-intensive or non-capital-intensive firms (in R&D-intensive or capital-intensive industry), R&D accounting and depreciation policies have little effect. If divergence were driven fully by firm-specific R&D or capital intensity, then there would be the same degree of divergence among firms with no R&D across different industries. The different divergence in ROA of these firms, however, indicates that to a large extent divergence is an industry-specific, rather than a firm-specific, phenomenon. More specifically, it is industry R&D intensity that drives divergence, and not firm-specific R&D intensity.

There are exceptions. For two R&D-intensive industries, divergence in ROA is stronger for R&D-intensive firms than non-R&D-intensive firms. The coefficients on Tm*R&D*RelSZ in Panel 7A are significant in industries SIC 35 (coef=0.053, t=2.94) and SIC 38 (coef=0.070, t=3.12).

R&D expensing *does* contribute to the higher degree of divergence of R&D-intensive firms. In Panel 7C, the coefficients on $\mathrm{Tm} * \mathrm{R\&D} * \mathrm{RelSZ}$ become negative and insignificant for SIC 35 (coef$=-0.010, t = -0.59$), and positive but insignificant for SIC 38 (coef=0.036 t=1.84). With R&D capitalization, therefore, divergence within an industry becomes nearly independent of firm-specific R&D intensity. The higher divergence in ROA among the R&D-intensive firms in Panel 5A (given the positive trend of R&D*RelSZ [coef=0.108, t=8.67]) is due to the higher divergence in profitability among firms in R&D-intensive industries (relative to those in non-R&D-intensive industries).

In the case of non-R&D-intensive industries, divergence among non-capital-intensive firms is significant only in the communications industry (SIC 48), with coefficient=0.014 (t=5.52). Divergence among highly capital-intensive firms is stronger in some industries (SIC 20 and 50, and “Others”), although it weakens when CFOA is used (Panel 8B). The difference between ROA and CFOA consists of accruals, including depreciation expenses. At this level of analysis, it is not possible to distinguish whether the divergence effect is due to depreciation accounting (e.g., accelerated depreciation) or fundamental economic forces (e.g., economies of scale and scope).

Comparing the coefficients on Tm*RelSZ in Panels 8A and 8B reveals a major difference in the SIC code 49 (electric, gas, and sanitary services), one of the most capital-intensive industries (mean PP&E/Assets=0.72). The coefficient on Tm*RelSZ here decreases from 0.000 (t=0.01) to −0.008. In this industry, capital-intensity-related variables (PP&E and interaction variables) are highly significant. The coefficient estimates suggest that while the ROA of large and small firms in this industry has diverged, divergence in cash flow occurs only among capital-intensive firms. Further investigation reveals that, in the 1990s, seven small firms exhibit highly negative ROA (less than −0.4) over multiple years, while their CFOAs were close to zero. SIC 49 is the most capital-intensive industry; depreciation expenses represent a large fraction of ROA of these firms, even for ones that are relatively non-capital-intensive. Thus, the discrepancy between ROA and CFOA divergence here is likely to be due to the higher depreciation expenses of these firms.

We summarize our empirical findings as follows:

1. Overall, profitability divergence is more pronounced in R&D-intensive industries than in non-R&D-intensive industries. Divergence is manifested in terms of cash flow, and not in terms of accruals.

2. Profitability divergence among non-R&D-intensive firms in R&D-intensive industries exhibits higher divergence than that among their peers in non-R&D-intensive industries with similar capital intensity. This leads us to conclude that profitability divergence, to a large extent, is caused by fundamental economic forces in R&D-intensive industries.

3. Within non-R&D-intensive industries (excluding the communication industry), firms with high capital intensity display mild divergence in both accruals and cash flow from operations, while firms with low capital intensity show no divergence in profitability.

4. In the communication industry (which has low average R&D intensity), firms exhibit strong profitability divergence in both cash flow and earnings. This divergence is independent of firm-specific R&D and capital intensity.

On the effect of R&D accounting, we have the following results:

1. R&D expensing contributes to the increase in the degree of divergence within R&D-intensive industries; divergence increases with R&D intensity within an R&D-intensive industry.

2. Once R&D is capitalized, the degree of divergence within each industry becomes independent of firm-specific R&D intensity. With this capitalization, non-R&D-intensive firms in R&D-intensive industries exhibit profitability divergence similar to their R&D-intensive peers.

6 Conclusions

In this paper, we examine the phenomenon of profits increasing with size (the "size effect"). In contrast to earlier findings of Schmalensee (1989), Domowitz, Hubbard, and Petersen (1988), and Dhawan, (2001), we find that the size effect has indeed increased over the last three decades. Even after controlling for sampling bias and for accounting conservatism, we find that small firms have become less profitable while large firms have remained profitable. Divergence has been a secular trend. While macroeconomic fluctuations might contribute to profitability divergence, what drive divergence are fundamental economic forces that are both industry-specific and size-specific. Thus, divergence appears to be not only *by size* but also *due to size*.

In examining the profitability and survival rates of IPOs, Fama and French [2004] dismiss the possibility that accounting rules might be an important factor. They state (p. 259):[14]

> We doubt that the vagaries of accounting can explain the major changes in profitability we observe, namely the increased left skewness of E/A for small firms and especially small new lists, which is not shared by big firms.

In contrast to their conjecture, we conclude that the "vagaries" of accounting *do* matter in explaining the divergence. In particular, we find that *ex post* (consistent with Givoly and Hayn, 2000), rather than *ex ante*, conservatism plays an important role in divergence, especially among larger firms. However, even after controlling for accounting factors, we still observe substantial profitability divergence.

[14]Profitability, E/A, is defined as annual earnings before interest but after taxes divided by total assets.

What makes large firms more profitable? What are the forces behind the widening profitability gap? While identifying all major forces is beyond the scope of this paper, our findings do underscore the growing importance of long-term investment in the U. S. economy. We find that profitability divergence is stronger within R&D-intensive industries and among firms with high PP&E, and strongest among smaller firms. Long-term investment, particularly in R&D, helps larger firms stay profitable, but appears to drain smaller firms; R&D investment is therefore likely to be an important driver of profitability divergence.

R&D activities have increased in importance in the U. S. By 1998, fully 60% of public firms belonged to R&D-intensive industries. Roughly half of these firms belonged to the three most R&D-intensive industries: pharmaceuticals (SIC 2834); semiconductors (SIC 3674); and business software and services (SIC 7371-9). These U. S. industries are highly competitive, fast-growing, and dominant in global competition. Yet, the characteristics of these industries are quite different in two important aspects: (1) the nature of technology; and (2) the nature of competition.

Both semiconductors and business services are vital to the information technology (IT) industry, supplying what economists call "general purpose technology" (GPT). The IT revolution, along with the invention of electricity, is viewed by many as one of the most important GPTs to date (Jovanovic and Rousseau, 2003). The higher mobility of resources and the need for information transmission require standardization, where economies of scale make large firms more advantageous (Shapiro and Varian, 1998). The IT industry is subject to vicious competition. Protection of new ideas and intellectual property is always difficult in GPT, and moreover technological changes occur too rapidly to accord much of an advantage from patents. As in earlier periods of major technological breakthrough (e.g., the development of railroads, motor vehicles, and airplanes), competition eventually results in the demise of many firms. Wars of attrition and winner-take-all victories are predictable for the IT industry. In such an environment, size could provide a better chance of survival and profitability.

The pharmaceutical(biotech) industry has also experienced tremendous growth and innovation. Although costly and time-consuming to develop, successful new drugs are protected from competition by patents and can generate large profits.[15] Large firms can diversify their portfolio of drugs and exploit economies of scope, but small firms typically focus on just a few. In many cases, small firms cannot sustain the losses that result from long development processes. Instead of driving these firms out of business, however, major pharmaceuticals companies often develop symbiotic relationships with small firms via, for example, strategic alliances.

The findings in this paper are consistent with the general notion that being large is advantageous because of economies of scale and scope. Moreover, we document that these advantages have increased over time. It is easier for large firms to take advantage of the fruits of R&D and capital investment by creating and increasing demand for new products, and through efficiency in production. A polarization in the corporate world, on the order of the "Winner Take All" game described by Frank and Cook (1995), is the probable outcome. Of course, all large firms were once small; this implies that growth is the key to higher profitability. The findings in this paper suggest that a firm would have to grow (much) faster than its leader to be able to "break out" of its size group.[16] Since growth and profits are endogenous, for a small, less profitable firm, breaking out of its pack poses a nontrivial challenge.

[15] DiMasi et al. [2003] estimate that the R&D cost of a new drug increased from $231 million (in 1987 dollars) to $802 million (in 2000 dollars). In addition, it typically takes 12-15 years for a new drug to advance through R&D and regulatory process before it is put on the market.

[16] Caves and Ghemawat (1992) suggest that there are barriers to mobility within each industry.

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Table 1: Equally-Weighted Profitability Measures

Panel 1A: Equally-Weighted Average Profitability

Year	#OBS	ROE	RNOA	ROA	CFOA	LEV
1975-9	4,236	0.133	0.205	0.064	0.093	0.524
1980-4	4,107	0.104	0.177	0.050	0.089	0.529
1985-9	4,572	0.049	0.136	0.026	0.070	0.530
1990-4	5,200	0.044	0.126	0.022	0.071	0.537
1995-9	6,523	0.018	0.106	0.009	0.060	0.516
2000-3	5,553	-0.046	-0.009	-0.025	0.057	0.515

Panel 1B: Size-Weighted Average Profitability

1975-9	4,236	0.147	0.181	0.061	0.112	0.586
1980-4	4,107	0.135	0.162	0.053	0.117	0.606
1985-9	4,572	0.127	0.156	0.044	0.103	0.655
1990-4	5,200	0.104	0.122	0.028	0.074	0.735
1995-9	6,523	0.134	0.142	0.033	0.074	0.752
2000-3	5,553	0.074	0.110	0.016	0.061	0.779

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows:

ROE: earnings before extraordinary items divided by beginning common equity (item #18 divided by #60)

ROA: earnings before extraordinary items divided by beginning total assets (item #18 divided by #6)

RNOA: operating income after depreciation divided by beginning operating assets (total assets minus cash) (item # 178 divided by #6 minus #1)

CFOA: cash flows from operations divided by beginning total assets (item #308 divided by #6)

LEV: total liabilities divided by total assets (item #181 divided by #6)

Table 2: ROE and ROA by Relative Size and by R&D Intensity

Firms are first partitioned into relative size groups in their respective industries and then sorted into Non-R&D- and R&D-intensive groups based on their R&D intensity level. The relative size of a firm j in year t is defined as $ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})$, where $\text{Sales}_{*,t-1}$ is the sales revenue of its industry leader (the firm with the highest sales in the same two-digit SIC code). For each industry, "Largest" includes all firms with sales equalling more than half of that of the industry leader; "Large" includes firms with sales between one-tenth to one-half of that of the industry leader; "Middling" includes firms with from one-hundredth to one-tenth, "Small," from one-thousandth to one hundredth, and "Smallest," less than one-thousandth of that of the industry leader.

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows: ROE is earnings before extraordinary items divided by beginning common equity (#18 divided by #60); ROA is earnings before extraordinary items divided by beginning total assets (item #18 divided by #6); and R&D is R&D expenditures divided by beginning total assets (item #46 divided #6).

Panel 2A: ROE, Non-R&D Intensive Firms (R&D/Assets$<$ 0.01)

Average Sales (in $million)	Smallest 12.6	Small 63.7	Middling 295.7	Large 1572.7	Largest 4131.3
1975-9	0.105	0.121	0.131	0.150	0.143
1980-4	0.046	0.088	0.126	0.134	0.113
1985-9	-0.049	0.045	0.087	0.109	0.116
1990-4	-0.034	0.042	0.082	0.085	0.092
1995-9	-0.134	0.020	0.087	0.106	0.145
2000-3	-0.173	-0.044	0.054	0.090	0.091

Panel 2B: ROE, R&D Intensive Firms (R&D/Assets $\geq$ 0.01)

Average Sales	15.2	89.3	546.0	3397.1	14147.2
1975-9	0.110	0.153	0.144	0.153	0.149
1980-4	0.079	0.116	0.114	0.132	0.118
1985-9	-0.049	0.050	0.091	0.154	0.124
1990-4	-0.054	0.048	0.099	0.135	0.112
1995-9	-0.166	0.039	0.117	0.199	0.174
2000-3	-0.309	-0.093	0.055	0.097	0.114

Panel 2C:	**ROA, Non-R&D Intensive Firms (R&D/Assets$<$ 0.01)**				
	Smallest	Small	Middling	Large	Largest
Mean Sales	12.6	63.7	295.7	1572.7	4131.3
1975-9	0.054	0.059	0.059	0.063	0.059
1980-4	0.028	0.044	0.054	0.056	0.049
1985-9	-0.016	0.026	0.040	0.047	0.049
1990-4	-0.011	0.023	0.037	0.034	0.035
1995-9	-0.049	0.018	0.039	0.038	0.045
2000-3	-0.081	-0.004	0.026	0.033	0.037

Panel 2D:	**ROA, R&D Intensive Firms (R&D/Assets $\geq$ 0.01)**				
Mean Sales	15.2	89.3	546.0	3397.1	14147.2
1975-9	0.063	0.082	0.077	0.077	0.073
1980-4	0.045	0.065	0.064	0.067	0.054
1985-9	-0.019	0.035	0.048	0.067	0.053
1990-4	-0.027	0.033	0.050	0.054	0.033
1995-9	-0.088	0.031	0.057	0.069	0.057
2000-3	-0.184	-0.048	0.026	0.040	0.041

Table 3: Descriptive Statistics: Variables for Regression

	Mean	Std Dev	10%-tile	median	90%-tile
ROE	0.046	0.315	-0.243	0.106	0.271
RNOA	0.120	0.361	-0.113	0.130	0.392
ROA	0.022	0.128	-0.100	0.042	0.132
CFOA	0.072	0.122	-0.063	0.079	0.203
ROA*	0.030	0.118	-0.086	0.043	0.139
CFOA*	0.092	0.117	-0.034	0.091	0.224
LEV	0.525	0.213	0.218	0.544	0.791
RelSZ	-4.803	2.315	-7.903	-4.759	-1.725
R&D	0.023	0.055	0.000	0.000	0.079
Age	14.050	11.612	2.000	10.000	32.000
*ln*Age	2.391	0.841	0.693	2.398	3.497
PPE	0.346	0.257	0.050	0.285	0.762

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows: ROE is earnings before extraordinary items divided by beginning common equity (#18 divided by #60); RNOA is earnings before extraordinary items divided by beginning operating assets (total assets minus cash) (item #18 divided by #6 minus #1); ROA is earnings before extraordinary items divided by beginning assets (item #18 divided by #6); CFOA is cash flow from operations divided by beginning total assets (cash flow from operations (item #308 divided by #6); ROA* and CFOA* are calculated using the capitalization rule in Lev and Sougiannis [1996]; LEV is total liabilities divided by total assets (item # 181 divided by #6); RelSZ is the natural log of the ratio of a firm's sales to that of the industry leader, defined as the firm with the highest sales figure [RelSZ = $\ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})$, where * represents the industry leader; R&D is the R&D expenditures divided by beginning total assets (#46 divided by #6); Age is the number of years a firm has been in the Compustat database measured as lnAge=ln(1+Age); PP&E is the net property, plant, and equipment divided by assets (#8 divided by #6).

Table 4: Regression of Profitability on Relative Size

$$\pi_{j,t} = \beta_o + \beta_1 \text{Tm} + \beta_2 \text{RelSZ}_{j,t} + \beta_3 \text{RelSZ}_{j,t} * \text{Tm} + \beta_4 ln\text{Age} + \beta_5 \text{IPO} + \text{Tm} * (\beta_6 ln\text{Age} + \beta_7 \text{IPO}) + \beta_8 \text{R\&D},$$

where π = ROA, CFOA. Tm is defined as a specific calendar year minus 1975 divided by ten; LEV is total liabilities divided by total assets (item # 181 divided by #6); RelSZ is the natural log of the ratio of a firm's sales to that of the industry leader, defined as the firm with the highest sales figure (RelSZ = $\ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})$, where * represents the industry leader); lnAge =ln(1+Age)and Age is the number of years a firm has been in the Compustat database; IPO is an indicator variable for the IPO year; R&D is R&D expenditures divided by beginning total assets (#46 divided by #6); ROA* and CFOA* are calculated using the capitalization rule in Lev and Sougiannis [1996].

Panel 4A: Group L firms (Relative Size> ln(1/100))

	Profitability Measure					
		= ROA			= CFOA	
	I	II	II'	I	II	II'
Tm	-0.002 (2.0)	-0.017 (10.7)	-0.017 (10.8)	-0.002 (1.6)	-0.010 (5.5)	-0.010 (5.5)
LEV	-0.143 (89.3)	-0.146 (90.8)	-0.147 (91.1)	-0.125 (65.0)	-0.126 (65.1)	-0.124 (63.7)
RelSZ	0.002 (4.3)	0.003 (7.1)	0.003 (7.5)	0.007 (14.5)	0.008 (14.7)	0.008 (14.3)
Tm*RelSZ	0.003 (10.9)	0.002 (8.0)	0.002 (7.9)	0.000 (0.5)	-0.001 (1.9)	-0.001 (1.7)
lnAge		-0.008 (9.6)	-0.008 (9.7)		-0.003 (2.7)	-0.003 (2.6)
IPO		-0.003 (1.9)	-0.003 (1.9)		0.003 (1.5)	0.003 (1.5)
Tm*lnAge		0.005 (11.0)	0.005 (11.1)		0.003 (5.4)	0.003 (5.3)
Tm*IPO		0.017 (8.5)	0.017 (8.6)		0.001 (0.6)	0.001 (0.6)
R&D			-0.105 (7.7)			0.116 (7.1)
		= ROA*			= CFOA*	
	I	II	II'	I	II	II'
Tm	-0.002 (2.5)	-0.016 (10.5)	-0.016 (10.5)	-0.001 (1.5)	-0.011 (5.7)	-0.010 (5.4)
LEV	-0.146 (92.5)	-0.149 (94.4)	-0.148 (93.0)	-0.135 (70.0)	-0.137 (70.2)	-0.126 (65.1)
RelSZ	0.002 (4.7)	0.004 (8.1)	0.003 (7.8)	0.008 (16.5)	0.009 (17.0)	0.008 (14.6)
Tm*RelSZ	0.003 (10.3)	0.002 (7.5)	0.002 (7.6)	0.000 (1.3)	-0.001 (2.7)	-0.001 (1.7)
lnAge		-0.009 (11.3)	-0.009 (11.2)		-0.004 (3.7)	-0.003 (3.0)
IPO		-0.003 (2.0)	-0.003 (2.0)		0.003 (1.2)	0.003 (1.5)
Tm*lnAge		0.005 (10.6)	0.005 (10.5)		0.003 (5.7)	0.003 (5.1)
Tm*IPO		0.018 (9.2)	0.018 (9.2)		0.003 (1.1)	0.002 (0.7)
R&D			0.066 (5.0)			0.736 (45.4)
Number of Observations: 69,279						

Panel 4B: Group S firms (Relative Size$\leq ln(1/100)$)

	Profitability Measure					
		= ROA			= CFOA	
	I	II	II'	I	II	II'
Tm	0.088 (25.8)	0.025 (5.5)	0.018 (4.2)	0.071 (22.8)	0.032 (7.8)	0.028 (6.9)
LEV	-0.075 (29.1)	-0.087 (33.6)	-0.099 (38.8)	-0.067 (28.4)	-0.072 (30.7)	-0.080 (34.2)
RelSZ	-0.001 (0.7)	0.001 (1.2)	0.003 (3.2)	0.005 (6.2)	0.005 (5.4)	0.006 (6.8)
Tm*RelSZ	0.020 (39.2)	0.019 (36.3)	0.017 (32.6)	0.014 (30.0)	0.014 (28.5)	0.012 (25.7)
*ln*Age		-0.020 (10.4)	-0.023 (11.6)		-0.005 (2.7)	-0.006 (3.5)
IPO		-0.014 (5.2)	-0.013 (5.0)		-0.009 (3.8)	-0.009 (3.6)
Tm**ln*Age		0.023 (22.3)	0.023 (21.8)		0.015 (15.4)	0.014 (15.0)
Tm*IPO		0.062 (19.6)	0.059 (18.9)		0.031 (10.5)	0.029 (9.9)
R&D			-0.414 (47.9)			-0.269 (33.7)
		= ROA*			= CFOA*	
	I	II	II'	I	II	II'
Tm	0.070 (22.2)	0.016 (3.9)	0.016 (3.8)	0.048 (15.8)	0.017 (4.3)	0.024 (6.1)
LEV	-0.094 (39.8)	-0.105 (44.6)	-0.106 (44.6)	-0.100 (44.1)	-0.105 (45.9)	-0.092 (41.0)
RelSZ	0.002 (1.8)	0.005 (5.4)	0.005 (5.5)	0.008 (9.7)	0.009 (10.5)	0.007 (8.4)
Tm*RelSZ	0.017 (34.8)	0.015 (31.4)	0.015 (31.0)	0.009 (20.0)	0.008 (18.1)	0.011 (23.3)
*ln*Age		-0.025 (14.0)	-0.025 (14.0)		-0.010 (6.0)	-0.008 (4.8)
IPO		-0.010 (4.0)	-0.010 (4.0)		-0.006 (2.6)	-0.007 (3.0)
Tm**ln*Age		0.019 (20.1)	0.019 (20.1)		0.011 (12.1)	0.012 (13.2)
Tm*IPO		0.058 (20.1)	0.058 (20.0)		0.025 (9.0)	0.028 (10.3)
R&D			-0.022 (2.7)			0.428 (56.3)
Number of Observations: 76,126						

Table 5: Analysis of Divergence Based on Age Cohort

The estimation involves two stages. In the first stage, one estimates the model:

$$\begin{aligned}\pi_{j,i}^{g,t} &= \beta_o^{g,t} + \beta_1^{g,t}\,\mathrm{LEV}_{j,i} + \beta_2^{g,t}\,\mathrm{RelSZ}_{j,i} + \beta_3^{g,t}\mathrm{R\&D}_{j,i} + \beta_4^{g,t}\mathrm{R\&D} * \mathrm{RelSZ}_{j,i} \\ &\quad + \beta_5^{g,t}\mathrm{PP\&E}_{j,i} + \beta_6^{g,t}\mathrm{PP\&E} * \mathrm{RelSZ}_{j,i} + \beta_7^{g,t}\mathrm{IPO},\end{aligned} \quad (6)$$

for firm j in industry i, age cohort g, and year t. In the second stage, the estimated coefficients from the above model are regressed against year ($\beta_k^{g,t} = \beta_{k,o} + \beta_{k,1}t$). Table 5 reports $\beta_{k,o}$ as "Initial" (initial value) and $\beta_{k,1}$ as "Trend." Age cohorts are based on each 5-year period starting in 1975; all firms that went public before 1975 are placed in a separate cohort.

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows: LEV is total liabilities divided by total assets (item # 181 divided by #6); RelSZ is the natural log of the ratio of a firm's sales to that of the industry leader, defined as the firm with the highest sales figure (RelSZ = $\ln(\mathrm{Sales}_{j,t-1}/\mathrm{Sales}_{*,t-1})$, where * represents the industry leader); ROE is earnings before extraordinary items divided by beginning common equity (#item 18 divided by #60); IPO is an indicator variable for the IPO year; R&D is the R&D expenditures divided by beginning total assets (#46 divided by #6); PP&E is the net property, plant, and equipment d ivided total assets (#8 divided by #6).

Panel 5A: Group L Firms (Relative Size> ln(1/100))

	Profitability Measure			
	= ROA		= CFOA	
Coefficient	Initial	Trend	Initial	Trend
Reduced model				
LEV	-0.184 (48.41)	0.021 (8.17)	-0.135 (25.06)	0.005 (1.52)
RelSZ	0.003 (7.19)	0.002 (6.43)	0.007 (10.67)	0.000 (0.10)
IPO	-0.001 (0.42)	0.000 (3.03)	0.004 (1.21)	0.000 (0.10)
Full model				
LEV	-0.185 (48.22)	0.021 (8.10)	-0.135 (25.11)	0.006 (1.88)
RelSZ	0.009 (11.79)	-0.001 (2.45)	0.012 (8.14)	-0.002 (3.07)
R&D	-0.382 (5.29)	0.266 (6.24)	0.101 (0.94)	0.153 (2.75)
R&D*RelSZ	-0.134 (5.92)	0.093 (6.85)	-0.010 (0.32)	0.040 (2.32)
PP&E	-0.044 (8.36)	0.026 (7.25)	0.042 (4.61)	0.016 (3.01)
PP&E*RelSZ	-0.012 (7.52)	0.005 (4.97)	-0.015 (6.04)	0.006 (4.23)
IPO	0.000 (0.09)	0.000 (2.64)	0.005 (1.61)	0.000 (0.39)

	Profitability Measure			
	= ROA*		= CFOA*	
Coefficient	Initial	Trend	Initial	Trend
LEV	-0.182 (47.44)	0.020 (7.62)	-0.134 (25.02)	0.005 (1.57)
RelSZ	0.010 (12.41)	-0.002 (3.00)	0.012 (8.59)	-0.003 (3.43)
R&D	-0.312 (4.60)	0.262 (6.62)	0.778 (7.62)	0.110 (2.06)
R&D*RelSZ	-0.171 (8.17)	0.108 (8.67)	-0.040 (1.30)	0.054 (3.32)
PP&E	-0.045 (8.58)	0.026 (7.41)	0.038 (4.23)	0.017 (3.19)
PP&E*RelSZ	-0.012 (7.85)	0.006 (5.25)	-0.016 (6.33)	0.007 (4.51)
IPO	0.001 (0.31)	0.000 (2.87)	0.005 (1.65)	0.000 (0.31)

Panel 5B: Group S Firms (Relative Size≤ ln(1/100))

	Profitability Measure = ROA		Profitability Measure = CFOA	
Coefficient	Initial	Trend	Initial	Trend
Reduced model				
LEV	-0.139 (29.73)	0.017 (4.96)	-0.104 (16.85)	0.013 (3.62)
RelSZ	0.006 (3.68)	0.014 (12.11)	0.002 (0.97)	0.014 (11.92)
IPO	-0.003 (0.84)	0.002 (6.36)	-0.007 (2.69)	0.001 (3.91)
Full model				
LEV	-0.137 (30.17)	0.012 (3.69)	-0.111 (16.83)	0.010 (2.76)
RelSZ	0.007 (3.29)	0.011 (7.80)	-0.001 (0.39)	0.012 (8.07)
R&D	0.922 (5.33)	-0.284 (3.08)	1.009 (4.64)	-0.215 (2.09)
R&D*RelSZ	0.117 (4.40)	-0.009 (0.66)	0.132 (4.29)	-0.011 (0.74)
PP&E	-0.037 (2.74)	0.027 (2.80)	0.136 (5.75)	0.004 (0.32)
PP&E*RelSZ	-0.004 (1.60)	0.003 (1.60)	0.006 (1.85)	0.000 (0.02)
IPO	0.000 (0.02)	0.002 (5.40)	-0.006 (2.50)	0.001 (3.52)

	Profitability Measure = ROA*		Profitability Measure = CFOA*	
Coefficient	Initial	Trend	Initial	Trend
LEV	-0.134 (30.36)	0.007 (2.31)	-0.110 (17.10)	0.004 (1.18)
RelSZ	0.007 (3.09)	0.012 (8.39)	-0.002 (0.62)	0.011 (8.34)
R&D	1.182 (7.89)	-0.423 (5.48)	1.914 (12.07)	-0.450 (6.09)
R&D*RelSZ	0.125 (5.91)	-0.036 (3.31)	0.155 (7.22)	-0.036 (3.65)
PP&E	-0.032 (2.18)	0.022 (2.19)	0.143 (6.23)	0.003 (0.20)
PP&E*RelSZ	-0.003 (1.19)	0.002 (1.17)	0.007 (2.20)	0.001 (0.31)
IPO	0.003 (0.74)	0.002 (5.56)	-0.005 (1.92)	0.001 (3.62)

Table 6: Regression of Profitability by Industry

Dependent Variable: ROA

For each industry, i, the models estimated below are of the form:

$$\pi_i^{g,t} = \beta_o^{g,t} + \beta_{1,o}\,\text{LEV}_{j,i} + \beta_{2,o}\,\text{RelSZ}_{j,i} + \beta_{2,1}\,\text{RelSZ}_{j,i} * t \quad (7)$$

where j index the firm, and g and t index the age cohort and time. In Panels A and C, the variables RelSZ and RelSZ $* t$ are not included.

Non-R&D intensive industries include: 10-19, 20, 21, 23, 24, 27, 29, 31, 40-59, 61, 63, 65, 67, 70, 72, 75, 78, 79, 81, 83, 84, 89.

R&D intensive industries include: 1, 22, 25, 26, 28, 30, 32-39, 60, 62, 64, 73, 76, 80, 82, 86, 87, 99.

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows: Tm is defined as a specific calendar year minus 1975 divided by ten; LEV is total liabilities divided by total assets (# 181 by #6); RelSZ is the natural lof of the ratio of a firm's sales to that of the industry leader, defined as the firm with the highest sales figure (RelSZ = $\ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})$, where * represents the industry leader); ROA is the return on beginning total assets (item #18 divided #6).

Panel 6A: R&D Intensive Industries			SIC code			
Variables	28	35	36	38	73	Others
Tm	-0.059 (25.46)	-0.042 (23.80)	-0.046 (26.22)	-0.046 (20.25)	-0.080 (29.39)	-0.021 (26.78)
LEV	0.071 (7.94)	-0.036 (5.03)	-0.053 (7.22)	-0.039 (4.33)	0.068 (7.41)	-0.071 (22.22)
R-sq	9.3%	5.8%	6.4%	5.1%	9.3%	4.5%
Panel 6B: R&D Intensive Industries, with Divergence Effect						
Tm	0.061 (12.67)	0.032 (6.11)	0.020 (3.52)	0.064 (9.70)	0.080 (8.03)	0.011 (6.48)
LEV	-0.121 (13.77)	-0.083 (11.51)	-0.097 (13.28)	-0.121 (13.94)	-0.013 (1.46)	-0.104 (32.37)
RelSZ	-0.003 (1.60)	-0.004 (2.43)	0.000 (0.19)	-0.004 (1.95)	-0.012 (3.92)	0.000 (0.31)
Tm*RelSZ	0.021 (23.35)	0.012 (13.95)	0.011 (12.31)	0.020 (17.39)	0.024 (16.40)	0.007 (20.00)
R-sq	31.1%	11.7%	12.1%	17.8%	18.7%	10.0%
OBS(1975)	187	291	272	183	121	1060
OBS(2003)	282	259	352	279	464	714

Panel 6C: Non-R&D Intensive Industries			SIC code			
Variables	13	20	48	49	50	Others
Tm	-0.019 (9.02)	-0.014 (9.05)	-0.050 (21.17)	-0.011 (19.35)	-0.020 (10.19)	-0.016 (28.82)
LEV	-0.022 (2.65)	-0.093 (13.40)	-0.017 (1.63)	-0.027 (6.26)	-0.078 (9.65)	-0.069 (31.93)
R-sq	1.6%	6.3%	8.2%	3.7%	4.6%	4.4%
Panel 6D: Non-R&D Intensive Industries, with Divergence Effect						
Tm	-0.004 (0.62)	0.020 (5.79)	0.046 (7.97)	0.004 (3.26)	0.014 (2.05)	0.001 (0.97)
LEV	-0.086 (10.52)	-0.153 (22.13)	-0.086 (8.75)	-0.056 (12.61)	-0.106 (13.24)	-0.096 (44.11)
RelSZ	0.014 (8.89)	0.006 (4.49)	-0.008 (4.76)	-0.001 (1.22)	0.004 (2.22)	0.006 (11.02)
Tm*RelSZ	0.003 (3.17)	0.006 (8.00)	0.018 (18.93)	0.004 (12.57)	0.006 (5.38)	0.004 (13.36)
R-sq	11.2%	18.8%	25.1%	8.0%	10.4%	10.3%
OBS(1975)	128	175	104	337	140	1341
OBS(2003)	157	101	152	297	111	1369

Table 7: Regression of Profitability by Industries
R&D-Intensive Industries (Mean R&D/Assets$\geq$ 0.005)

For each industry, i, the model estimated is:

$$\begin{aligned}\pi_i^{g,t} &= \beta_o^{g,t} + \beta_{1,o}\,\mathrm{LEV}_i + \beta_{2,o}\,\mathrm{RelSZ}_i + \beta_{3,o}\mathrm{R\&D}_i + \beta_{4,0}\mathrm{R\&D} * \mathrm{RelSZ}_i + \beta_{5,o}\mathrm{PP\&E}_i \\ &\quad + \beta_{6,o}\mathrm{PP\&E} * \mathrm{RelSZ}_i + \beta_{7,o}\mathrm{IPO} + \mathrm{Tm} * [\beta_{1,1}\,\mathrm{LEV}_i + \beta_{2,1}\,\mathrm{RelSZ}_i + \beta_{3,1}\mathrm{R\&D}_i \\ &\quad + \beta_{4,1}\mathrm{R\&D} * \mathrm{RelSZ}_i + \beta_{5,1}\mathrm{PP\&E}_i + \beta_{6,1}\mathrm{PP\&E} * \mathrm{RelSZ}_i + \beta_{7,1}\mathrm{IPO}].\end{aligned} \tag{8}$$

The data are collected from COMPUSTAT's Industrial and Research Annual Database. Variables are defined as follows: LEV is total liabilities divided by beginning total assets (item # 181 divided by #6); Tm is defined as a specific calendar year minus 1975 divided by ten; RelSZ is the natural log of the ratio of a firm's sales to that of the industry leader, defined as the firm with the highest sales figure (RelSZ = $\ln(\mathrm{Sales}_{j,t-1}/\mathrm{Sales}_{*,t-1})$, where * represents the industry leader); ROA is the return on assets (#18 divided by #6); IPO is an indicator variable for the IPO year; R&D is R&D expenditures divided by beginning total assets (#46 divided by #6); PP&E is net property, plant, and equipment divided by total assets (#8 divided by #6).

Panel 7A: Dependent Variable: ROA

	SIC code					
Variables	28	35	36	38	73	Others
Intermediate Model						
LEV	-0.208 (10.52)	-0.187 (11.91)	-0.191 (11.53)	-0.166 (7.84)	-0.208 (8.06)	-0.153 (22.37)
Tm*LEV	0.025 (2.42)	0.042 (4.74)	0.033 (3.66)	0.013 (1.14)	0.075 (5.99)	0.026 (6.68)
RelSZ	0.009 (3.67)	-0.002 (0.91)	0.004 (1.57)	-0.001 (0.22)	0.015 (3.68)	0.002 (1.70)
Tm*RelSZ	0.008 (8.33)	0.008 (7.62)	0.007 (7.60)	0.015 (10.37)	0.012 (6.75)	0.006 (14.16)
IPO	0.020 (4.63)	0.035 (8.72)	0.030 (7.83)	0.028 (5.96)	0.041 (9.20)	0.018 (10.34)
R&D	0.599 (7.94)	0.452 (5.18)	0.303 (3.54)	0.704 (6.83)	0.217 (2.04)	0.003 (0.06)
R&D*RelSZ	0.164 (16.89)	0.116 (9.76)	0.095 (8.26)	0.164 (10.71)	0.054 (3.90)	0.095 (10.63)
PP&E	-0.147 (5.96)	-0.006 (0.17)	-0.068 (1.74)	-0.152 (3.18)	-0.124 (2.95)	-0.023 (3.19)
PP&E*RelSZ	-0.022 (5.60)	-0.004 (0.74)	-0.010 (1.68)	-0.021 (2.83)	-0.018 (3.16)	-0.002 (1.53)
R-sq	48.0%	20.7%	23.6%	26.8%	29.5%	14.8%
Full Model						
LEV	-0.179 (8.55)	-0.170 (10.73)	-0.176 (10.54)	-0.156 (7.29)	-0.196 (7.47)	-0.145 (21.14)
Tm*LEV	0.012 (1.07)	0.031 (3.35)	0.024 (2.67)	0.007 (0.63)	0.067 (5.26)	0.020 (5.19)
RelSZ	0.010 (2.14)	0.001 (0.19)	0.010 (2.47)	0.011 (2.02)	0.008 (1.31)	0.000 (0.02)
Tm*RelSZ	0.008 (3.57)	0.007 (2.99)	0.004 (2.04)	0.008 (2.73)	0.015 (5.49)	0.007 (8.80)
IPO	0.025 (2.30)	0.011 (1.35)	0.028 (3.30)	0.014 (1.39)	0.022 (1.73)	0.002 (0.55)
Tm*IPO	-0.003 (0.48)	0.016 (3.16)	0.002 (0.32)	0.010 (1.60)	0.011 (1.63)	0.011 (4.80)
R&D	1.070 (4.51)	0.344 (1.40)	1.036 (4.52)	0.198 (0.68)	0.207 (0.49)	-0.022 (0.17)
Tm*R&D	-0.245 (2.19)	-0.002 (0.01)	-0.410 (3.70)	0.221 (1.54)	0.001 (0.01)	-0.014 (0.20)
R&D*RelSZ	0.166 (5.16)	-0.002 (0.07)	0.131 (4.08)	0.016 (0.36)	0.042 (0.75)	-0.036 (1.56)
Tm*R&D*RelSZ	-0.005 (0.31)	0.053 (2.94)	-0.023 (1.50)	0.070 (3.12)	0.005 (0.19)	0.063 (5.35)
PP&E	-0.150 (2.65)	0.023 (0.34)	-0.293 (2.97)	-0.267 (2.79)	-0.014 (0.14)	0.005 (0.31)
Tm*PP&E	-0.002 (0.08)	-0.019 (0.45)	0.105 (2.13)	0.082 (1.43)	-0.055 (1.06)	-0.017 (1.98)
PP&E*RelSZ	-0.024 (2.39)	0.005 (0.48)	-0.040 (2.75)	-0.031 (2.00)	0.007 (0.50)	0.008 (2.51)
Tm*PP&E*RelSZ	0.001 (0.14)	-0.006 (0.90)	0.014 (1.92)	0.007 (0.77)	-0.013 (1.82)	-0.007 (3.69)
R-sq	48.3%	21.9%	24.2%	27.4%	29.6%	15.5%
Mean PP&E	0.303	0.219	0.233	0.202	0.186	0.323
Mean R&D	0.066	0.060	0.063	0.077	0.066	0.011
OBS(1975)	187	291	272	183	121	1060
OBS(2003)	282	259	352	279	464	714

Panel 7B: Dependent Variable: CFOA

	SIC code					
Variables	28	35	36	38	73	Others
LEV	-0.122 (6.39)	-0.095 (6.55)	-0.116 (7.41)	-0.103 (5.35)	-0.141 (6.49)	-0.097 (13.70)
Tm*LEV	-0.008 (0.82)	-0.002 (0.24)	0.002 (0.22)	0.001 (0.13)	0.034 (3.23)	0.000 (0.11)
RelSZ	0.014 (3.46)	0.001 (0.39)	0.005 (1.24)	0.005 (1.02)	0.004 (0.92)	0.001 (0.49)
Tm*RelSZ	0.005 (2.30)	0.008 (3.93)	0.004 (2.07)	0.008 (3.06)	0.011 (4.98)	0.006 (7.49)
IPO	0.008 (0.80)	-0.027 (3.45)	-0.004 (0.49)	-0.008 (0.87)	-0.013 (1.24)	-0.006 (1.49)
Tm*IPO	0.004 (0.81)	0.017 (3.61)	0.010 (2.10)	0.018 (3.24)	0.014 (2.59)	0.008 (3.44)
R&D	0.970 (4.50)	0.453 (2.01)	0.508 (2.36)	0.189 (0.72)	1.094 (3.14)	0.436 (3.15)
Tm*R&D	-0.200 (1.96)	0.017 (0.15)	0.071 (0.68)	0.278 (2.15)	-0.224 (1.41)	-0.139 (1.88)
R&D*RelSZ	0.137 (4.68)	0.054 (1.62)	0.051 (1.68)	0.023 (0.55)	0.120 (2.58)	0.024 (1.01)
Tm*R&D*RelSZ	0.000 (0.03)	0.021 (1.28)	0.032 (2.24)	0.069 (3.46)	-0.015 (0.71)	0.028 (2.33)
PP&E	0.030 (0.58)	0.239 (3.87)	0.138 (1.49)	0.090 (1.05)	0.215 (2.63)	0.119 (7.56)
Tm*PP&E	-0.033 (1.22)	-0.121 (3.05)	0.017 (0.38)	-0.016 (0.31)	-0.047 (1.10)	-0.039 (4.35)
PP&E*RelSZ	-0.026 (2.80)	0.014 (1.37)	0.001 (0.04)	0.006 (0.43)	0.007 (0.57)	0.006 (1.85)
Tm*PP&E*RelSZ	0.005 (1.04)	-0.018 (2.89)	0.002 (0.24)	-0.008 (1.00)	-0.004 (0.73)	-0.007 (3.49)
R-sq	46.1%	17.3%	18.4%	25.0%	21.8%	11.0%

Panel 7C: Dependent Variable: ROA*

LEV	-0.177 (9.94)	-0.162 (11.32)	-0.164 (11.04)	-0.149 (7.95)	-0.196 (8.06)	-0.145 (21.75)
Tm*LEV	0.008 (0.90)	0.017 (2.04)	0.009 (1.11)	-0.002 (0.23)	0.055 (4.61)	0.019 (5.12)
RelSZ	0.009 (2.33)	-0.002 (0.59)	0.010 (2.80)	0.010 (2.06)	0.011 (2.09)	0.000 (0.09)
Tm*RelSZ	0.009 (4.77)	0.009 (4.74)	0.005 (2.37)	0.010 (3.82)	0.014 (5.38)	0.007 (9.42)
IPO	0.025 (2.78)	0.020 (2.58)	0.032 (4.34)	0.021 (2.36)	0.038 (3.30)	0.004 (1.25)
Tm*IPO	0.000 (0.02)	0.017 (3.69)	0.008 (1.89)	0.013 (2.43)	0.006 (0.97)	0.010 (4.58)
R&D	0.966 (4.80)	1.134 (5.13)	1.122 (5.49)	0.333 (1.29)	0.193 (0.50)	0.180 (1.39)
Tm*R&D	-0.257 (2.70)	-0.414 (3.71)	-0.398 (4.04)	0.054 (0.42)	-0.010 (0.06)	-0.046 (0.66)
R&D*RelSZ	0.115 (4.22)	0.076 (2.31)	0.115 (4.03)	0.010 (0.24)	-0.005 (0.10)	-0.024 (1.07)
Tm*R&D*RelSZ	-0.019 (1.48)	-0.010 (0.59)	-0.032 (2.33)	0.036 (1.84)	0.002 (0.10)	0.036 (3.11)
PP&E	-0.128 (2.67)	0.042 (0.69)	-0.259 (2.95)	-0.248 (2.95)	-0.047 (0.51)	0.004 (0.29)
Tm*PP&E	-0.020 (0.77)	-0.047 (1.21)	0.084 (1.93)	0.063 (1.26)	-0.036 (0.76)	-0.018 (2.09)
PP&E*RelSZ	-0.021 (2.45)	0.008 (0.80)	-0.035 (2.76)	-0.026 (1.93)	0.002 (0.16)	0.009 (2.63)
Tm*PP&E*RelSZ	-0.001 (0.16)	-0.009 (1.46)	0.012 (1.91)	0.003 (0.39)	-0.010 (1.51)	-0.007 (3.95)
R-sq	34.0%	21.1%	22.1%	24.7%	28.2%	13.3%

Table 8: Regression of Profitability by Industries
Non-R&D Intensive Industries (Mean R&D/Assets< 0.005)

The data are collected from COMPUSTAT's Industrial and Research Annual Database. LEV is total liabilities divided by total assets (item # 181 divided #6); Tm is defined as a specific calendar year minus 1975 divided by ten; RelSZ is the natural log of the ratio of a firm's sales to that of the industry leader, defined as the firm with the largest sales (RelSZ = $\ln(\text{Sales}_{j,t-1}/\text{Sales}_{*,t-1})$, where * represents the industry leader); ROA is the return on assets (#18 divided by #6); IPO is an indicator variable for the IPO year; R&D is the R&D expenditures divided by beginning total assets (#46 divided by #6); PP&E is net property, plant, and equipment divided by total assets (#8 divided by #6).

Panel 8A: Dependent Variable: ROA

	SIC code					
Variables	13	20	48	49	50	Others
LEV	-0.112 (6.70)	-0.180 (12.26)	-0.209 (8.47)	-0.179 (16.12)	-0.180 (10.51)	-0.152 (30.01)
Tm*LEV	0.018 (1.74)	0.019 (2.22)	0.061 (4.87)	0.046 (7.47)	0.035 (3.44)	0.028 (10.29)
RelSZ	0.003 (0.49)	0.009 (2.30)	0.011 (2.16)	0.017 (7.37)	0.012 (4.06)	0.009 (8.85)
Tm*RelSZ	0.004 (0.96)	0.001 (0.36)	0.014 (5.52)	0.000 (0.01)	0.000 (0.26)	0.001 (1.73)
IPO	0.013 (1.66)	0.008 (0.99)	0.007 (0.87)	0.003 (0.94)	0.002 (0.19)	0.006 (2.22)
Tm*IPO	-0.003 (0.63)	0.004 (0.78)	0.001 (0.23)	0.006 (3.11)	0.017 (3.46)	0.006 (4.09)
R&D	2.052 (1.60)	0.003 (0.00)	-2.226 (2.02)	0.499 (0.38)	-1.550 (1.17)	-0.845 (2.87)
Tm*R&D	-1.201 (1.52)	0.074 (0.16)	0.658 (1.12)	-0.038 (0.05)	0.675 (1.01)	0.306 (2.01)
R&D*RelSZ	0.441 (2.24)	0.300 (2.18)	-0.230 (1.62)	0.106 (0.56)	-0.162 (1.05)	-0.105 (2.03)
Tm*R&D*RelSZ	-0.211 (1.61)	-0.117 (1.53)	0.113 (1.51)	0.040 (0.37)	0.138 (1.75)	0.096 (3.74)
PP&E	0.027 (0.42)	-0.037 (0.91)	-0.139 (3.23)	-0.082 (6.03)	-0.278 (3.61)	-0.027 (3.06)
Tm*PP&E	0.021 (0.59)	0.060 (2.42)	0.020 (0.89)	0.028 (3.56)	0.217 (4.45)	0.019 (3.99)
PP&E*RelSZ	0.007 (0.74)	-0.010 (1.13)	-0.024 (3.62)	-0.020 (6.72)	-0.044 (3.79)	-0.006 (2.72)
Tm*PP&E*RelSZ	0.003 (0.58)	0.012 (2.50)	-0.003 (0.76)	0.002 (0.91)	0.040 (5.41)	0.008 (7.28)
R-sq	25.0%	22.1%	35.7%	22.3%	20.8%	14.6%

Panel 8B: Dependent Variable: CFOA

LEV	-0.180 (11.06)	-0.167 (9.51)	-0.198 (9.73)	-0.180 (13.50)	-0.102 (4.89)	-0.115 (20.33)
Tm*LEV	0.057 (5.74)	0.019 (1.83)	0.063 (6.07)	0.036 (4.83)	0.019 (1.55)	0.012 (3.92)
RelSZ	0.002 (0.37)	0.005 (1.21)	0.010 (2.50)	0.037 (13.17)	-0.003 (0.84)	0.005 (4.22)
Tm*RelSZ	-0.001 (0.41)	0.003 (1.06)	0.008 (4.16)	-0.008 (5.13)	0.005 (2.53)	0.002 (3.82)
IPO	0.009 (1.24)	0.002 (0.22)	-0.003 (0.46)	0.019 (5.18)	-0.015 (1.55)	0.000 (0.07)
Tm*IPO	-0.006 (1.20)	0.007 (1.29)	0.005 (1.44)	-0.007 (3.14)	0.012 (1.94)	0.003 (1.62)
R&D	-1.248 (1.00)	0.390 (0.47)	-1.427 (1.58)	-2.159 (1.36)	0.151 (0.09)	-0.610 (1.85)
Tm*R&D	1.325 (1.73)	0.333 (0.60)	0.403 (0.84)	1.306 (1.44)	0.600 (0.74)	0.416 (2.44)
R&D*RelSZ	-0.155 (0.81)	0.305 (1.86)	-0.194 (1.66)	-0.272 (1.19)	0.011 (0.06)	-0.059 (1.02)
Tm*R&D*RelSZ	0.225 (1.76)	-0.057 (0.62)	0.091 (1.47)	0.210 (1.65)	0.083 (0.86)	0.087 (3.02)
PP&E	0.148 (2.36)	0.111 (2.26)	-0.073 (2.05)	-0.214 (13.06)	0.135 (1.44)	0.125 (12.68)
Tm*PP&E	0.056 (1.60)	0.024 (0.82)	0.055 (2.97)	0.086 (8.93)	0.103 (1.73)	-0.017 (3.19)
PP&E*RelSZ	0.016 (1.74)	-0.004 (0.38)	-0.023 (4.28)	-0.046 (12.80)	0.000 (0.00)	-0.001 (0.34)
Tm*PP&E*RelSZ	0.003 (0.61)	0.008 (1.43)	0.002 (0.51)	0.012 (5.71)	0.014 (1.51)	0.003 (2.36)
R-sq	18.5%	20.3%	39.6%	16.5%	14.2%	12.8%
Mean PP&E	0.687	0.386	0.554	0.724	0.159	0.341
OBS(1975)	128	175	104	337	140	1341
OBS(2003)	157	101	152	297	111	1369