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LIMITED MANAGERIAL ATTENTION AND CORPORATE AGING

Claudio Loderer
René Stulz
Urs Waelchli

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ABSTRACT

As firms have more assets in place, more of management's limited attention is focused on managing assets in place rather than developing new growth options. Consequently, as firms grow older, they have fewer growth options and a lower ability to generate new growth options. This simple theory predicts that Tobin's q falls with age. Further, competition in the product market is expected to slow down the decrease in Tobin's q because it forces firms to look for alternative sources of rents. Similarly, greater competition in the labor market reduces the decrease in Tobin's q with age because old firms are in a better position to hire employees that can help with innovation. In contrast, competition in the market for corporate control should accelerate the decline because it forces management to focus more on managing assets in place whose performance is more directly observable than on developing growth options where results may not be observable for some time. We find strong support for these predictions in tests using exogenous variation in competition.

Claudio Loderer
Universität Bern
Engehaldenstrasse 4
CH-3012 Bern, Switzerland
claudio.loderer@ifm.unibe.ch

René Stulz
The Ohio State University
Fisher College of Business
806A Fisher Hall
Columbus, OH 43210-1144
and NBER
stulz@cob.osu.edu

Urs Waelchli
Universität Bern
Engehaldenstrasse 4
CH-3012 Bern, Switzerland
urs.waelchli@ifm.unibe.ch

Why is it that older firms are worth less? Existing theories emphasize the fact that firms use up their growth opportunities and that their prospects become less uncertain (Pastor and Veronesi (2003)). However, these theories do not explain why firms cannot keep acquiring new growth opportunities and renew themselves. They also apply most forcefully to firms that went recently public. Yet, as we show, firm valuations measured by Tobin's q (estimated as the ratio of the market value of the firm's assets divided by their book value) fall by roughly 1% per year for firms that are older than five years since the IPO. In this paper, we develop and test a simple theory that explains why firms become less good at creating growth opportunities as they age and, therefore, helps us to better understand the effect of age on firm investment policies and valuation.

With our theory, management cannot devote as much attention to developing growth opportunities as the firm ages. Management has a finite amount of time to devote to managing a firm. At the top of the firm, the CEO's time is a binding constraint on his ability to pay attention and to manage different areas within the firm he leads. Before a firm goes public, management dedicates much of its time to developing growth options as the firm has few assets in place, and its ability to go public will generally depend on its prospects rather than on its assets in place. Firms go public to monetize these growth options and to raise funds to exercise them. Once a firm becomes public, management optimally spends more time managing its assets in place as the firm exercises its growth options and has to meet investors' expectations. The greater focus on assets in place means that less attention is devoted to developing new growth options. Therefore, as a firm ages, it has fewer growth options and becomes poorer at developing such options.

Any theory of Tobin's q that endows the firm with growth options that it exercises optimally over time concludes that Tobin's q falls as these growth options are exercised. However, such a theory cannot explain why firms do not replace these growth options. As assets in place increase, the firm has to develop more valuable growth options just to stay in place in terms of its Tobin's q. Hence, for the firm to keep developing growth options that allow its Tobin's q to stay constant, the CEO would have to give more attention to growth options, which is not possible as assets in place increasingly require her attention. As a result, a firm is very unlikely to ever replace the growth options that it had in its youth. We find strong support for this prediction. More specifically, adjusting q for calendar-year and industry effects, only 30% of the sample firms ever exceed the maximum q they reach during the first four years after listing. These findings could, in principle, reflect an IPO effect. Jain and Kini (1994), for example, find that operating performance deteriorates after the IPO. Moreover, Loughran and Ritter (1995), among others, document that the stock of newly listed firms underperforms significantly in the years after the IPO (see, however, Fama (1998)). Yet the same results obtain when we exclude firms younger than 10 years, and when we measure age relative to the date of incorporation rather than to that of listing. Hence, the evidence is distinct from a pure IPO effect.

Competition in the market for corporate control means that management has to focus on managing well assets in place since poor performance of assets in place is readily observable while the performance of management in generating growth opportunities that have yet to manifest themselves is much harder to assess. Therefore, we would expect firms to age more quickly, i.e., to have fewer growth options, and hence a lower Tobin's q, if there is more competition in the market for corporate control. This prediction can be tested using exogenous changes in the degree of competition in the market for corporate control. Using the state adoption of business combination laws that restrict competition in the market for corporate control, we show in a difference-in-differences setting that Tobin's q falls more slowly with age for firms incorporated in states where such laws are put in place.

Product market competition lowers the value of the firm's assets in place. Escaping competition and regaining rents is a major motivation for firms to focus on innovation. This "escape competition" motive for innovation has been formalized in Aghion, Harris, Howitt, and Vickers' (2001) endogenous growth model, among others. It is also consistent with recent studies that find that competition spurs growth (Asker, Farre-Mensa, and Ljungqvist (2013); Fogel, Morck, and Yeung (2008)) and innovation (Bernstein (2012)). If product market competition makes the assets in place less valuable, we would expect the CEO to spend more time on creating new growth opportunities for the firm's core competences and less time on managing assets in place. Therefore, older firms in a competitive industry should be relatively better at creating new growth opportunities than their peers in non-competitive industries. To test this prediction, we use the industry concentration index suggested by Hoberg and Phillips (2011) to identify firms that operate in a more competitive environment. Consistent with our prediction, we find that the age effect is lower for firms in competitive industries.

The result is not driven by the fact that firms in non-competitive industries start with higher q ratios and therefore experience a sharper decline over time.

One possible concern with this result is that the degree of competition could be endogenously determined. Firms with abnormally high q ratios tend to attract competitors, particularly in industries with low barriers to entry. This could reduce q ratios over time as well. To address this endogeneity issue, we look at industries that experienced exogenous competitive shocks, namely large reductions in import tariffs, during the sample period. Lower tariffs should intensify product market competition. The data are from Frésard and Valta (2012). Tariff reductions should be exogenous to corporate policies (see also Guadalupe and Wulf (2010)). Consistent with the notion that firms age less quickly in a competitive environment, the age effect shrinks significantly after tariff reductions.

Exogenous variation in labor markets provides another way to test the implications of our theory. Young firms are firms with growth options. They face the risk that employees will defect and take knowledge with them that is relevant to these growth options. In contrast, old firms that have focused on assets in place will lack employees that could help them innovate. We would therefore expect laws that restrict employee mobility to be valuable for young firms but hurt old firms. Hence, we would expect firms to age more quickly in states where non-competition agreements are more strongly enforced. We find that this is the case.

It is much easier to evaluate whether management is doing well at managing assets in place than at developing new growth options. Firms disclose data that enable investors to compute a wide range of metrics to assess management's performance at managing assets in place. Most simply, investors can estimate the profitability of these assets. Management's efforts at developing new growth options typically involve R&D investments, which are notoriously difficult to evaluate from outside the firm (Edmans, Heinle, and Huang (2013)). Further, it is often the case that management cannot disclose the progress made through these investments because doing so it would provide valuable proprietary information to competitors (Verrecchia (1983)). Financial analysts, shareholders, and media monitoring the firm will find it more difficult to assess management's performance in generating growth options than in assessing its performance managing assets in place. Hence, outside monitoring will focus management's attention more on assets in place than on generating growth options (see also

Edmans, Heinle, and Huang (2013)). Management will also be more focused on preventing bad surprises from assets in place, which will lead it to develop mechanisms within the firm that control the performance of assets in place more tightly. In particular, rules are adopted to economize on managerial attention. While such mechanisms are helpful for the performance of assets in place, they make innovation within the firm more difficult as they reduce the discretion of employees within the firm.

Our arguments are related to those advanced by Holmstrom (1989). When firms go public to fund the exercise of growth options, they become larger, more complex organizations. In larger firms, according to Holmstrom, it is difficult to provide incentives for such different activities as production/marketing and innovation. To reap the financial rewards from their growth opportunities, listed firms therefore rationally rely more on rigid rules as a substitute for incentives. This compromises the willingness to experiment and innovate, and screens out innovative personalities. In addition, listed firms are more dependent on the capital markets and are therefore more concerned about their reputation. Concern about funding, according to Holmstrom, has a tendency to make larger firms myopic in their behavior and therefore less concerned about innovation. If they do invest, one could argue, insiders have an incentive to pursue incremental innovation projects because they have a higher probability of early success and are more easily understood by investors (Ferreira, Manso, and Silva (2012)). Incremental projects are tied to the lifecycle of the firm's products and therefore represent sources of growth opportunities that are limited in time.

At older firms, assets in place receive more attention than at younger firms. We therefore expect assets in place to be well-managed at such firms. The older firm becomes much more focused on being the best at what it does instead of being focused on developing new activities. However, this focus means that the firm will be less likely to innovate successfully. As its ability to innovate falls, it becomes less advantageous for the firm to try to innovate. Hence, we expect older firms to invest less in R&D and to become less likely to try to develop new businesses. These older firms will increasingly pay out their excess cash flows because they lack positive net present value projects. Our evidence supports these predictions. We find that the firms that become older do not become less efficient or more poorly managed. However, they spend less on R&D, invest less in capital expenditures, and pay out more. Well-known specific older firms in our sample seem to be firms that fit our theory. For instance, in 2009, these firms include Alcoa, Coca Cola, Dow Chemical, General Dynamics, Hershey, McDonald's, Pepsi, and Procter & Gamble. These firms are older and focused, and have comparatively lower growth opportunities.

There are several potential alternative explanations for the fact that old firms have lower Tobin's q ratios. The first one is that young firms are credit constrained. For a credit constrained firm, marginal q will be high. As the firm becomes less credit constrained, its marginal q falls. If marginal q is a declining function of the level of total past capital expenditures, we expect average q to exceed marginal q and to also decline. Hence, old firms that are not constrained will have a lower Tobin's q. To minimize the importance of this problem, most of our empirical work considers only firms that are at least five-years old. More importantly, we show that credit constraints cannot explain why firms that pay out cash to their shareholders (dividends or share buybacks) experience the same decline in Tobin's q ratios over time as other firms.

Another possible explanation is provided by agency theory. In a narrow sense, the explanation is that management is more likely to be entrenched in older firms so that for the same assets shareholders expect lower cash flows for older firms than for newer firms. With this explanation, management consumes more private benefits in older firms. Even though executive stock ownership is lower in older firms, and boards are larger, we find little evidence to support this implication. Management does not have more abnormal compensation in older firms. Further, older firms have greater payouts on average. Finally, the agency explanation of the decline in Tobin's q ratios over time cannot explain why firms that face less competition in the market for corporate control see their q ratios fall less quickly.

A broader version of the agency explanation is that entrenchment grows at many levels of the corporation and is not attached to individuals but to business units of the corporation. With this view, business units protect their turf, so that they prevent units with valuable growth opportunities from taking advantage of them (e.g., Scharfstein and Stein (2000); Rajan, Servaes, and Zingales (2000)). In other words, internal capital markets become less efficient as firms become older. This broader agency theory is not completely distinct from our theory of managerial attention. As the firm becomes more established, managers have to cater more to established units within the firm. However, this theory is hard to reconcile with our evidence that firms do not generally become less efficient in their core activities. Rather, this theory explains more why firms fail in renewing themselves through acquisitions because existing units may make it difficult to integrate the acquired unit.

Lastly, one might argue that lifecycle theories of the firm make predictions similar to some of those we test (Fama and French (2001); Grullon, Michaely, and Swaminathan (2002); DeAngelo, DeAngelo, and Stulz (2006)). In particular, these theories also predict that older firms pay out more. However, the critical difference between our paper and papers inspired by these theories is that we develop a specific mechanism that leads older firms to differ from young ones and test this specific mechanism. The key tests of our mechanism exploit exogenous variation in competition. These tests have no counterpart in the literature inspired by lifecycle theories.

The paper proceeds as follows. In the first section, we expand the presentation of our theory and derive more precisely its testable hypotheses. In Section II, we discuss the data. In Section III, we show that Tobin's q falls with age across industries, and firms are unlikely to ever again achieve the Tobin's q of their youth. We investigate the role of competition in the decrease in Tobin's q in Section IV. In Section V, we show that old firms are more efficient, invest less, pay out more, and are more focused. In Section VI, we investigate whether the predictions of alternative theories of aging are supported by the evidence. We conclude in Section VII.

I. Theoretical considerations

In this section, we present in greater detail our theory of managerial attention and show how it leads to the hypotheses we test in the paper. We take the view that the essence of the CEO's job is to make choices for the firm. If he makes the right choices, the firm is more likely to do well. Otherwise, it is more likely to struggle.

To make our ideas more concrete, we consider the simple case of a CEO who has to allocate his time between two activities. Once he has allocated his time, these activities generate a payoff. The payoff of an activity is positive if the CEO makes the right decisions in that activity and zero otherwise. To make decisions, the CEO has to become informed about their consequences. The more time he allocates to an activity, the more likely she is to make the right decisions. The CEO lives for only one period. Compensation contracts that make the CEO's compensation dependent on future periods are assumed not to be possible.

The activities are *a* and *b*. If she makes the right choices, the firm has a payoff of A with activity *a* and of B with activity *b*. If the CEO makes the wrong choices in an activity, the payoff of the activity is zero. There is no way for the CEO to know for sure whether she is making the right decisions, but the probability of making the right decisions in an activity is an increasing concave function of the time spent on the activity. Consequently, if the time spent is *e*, the probability of making the right decisions in activity *a* is $p(e)$, with $p'(e) > 0$ and $p''(e) < 0$. The probability of making the right decisions with activity *b* is q(e). This probability is also an increasing concave function of the time allocated to that activity. We assume that the CEO allocates all her time, so that our model is not a model about how hard the CEO works. The CEO has total time of L, so that she allocates L – *e* to activity *b*. The time allocation of the CEO is not observable, so that pay cannot be a function of *e*.

We assume that the CEO is risk neutral and that his utility is equal to her expected income. For simplicity, we assume that the CEO's compensation is simply a fraction *s* of the firm's payoff. With these assumptions, the expected utility of the CEO is:

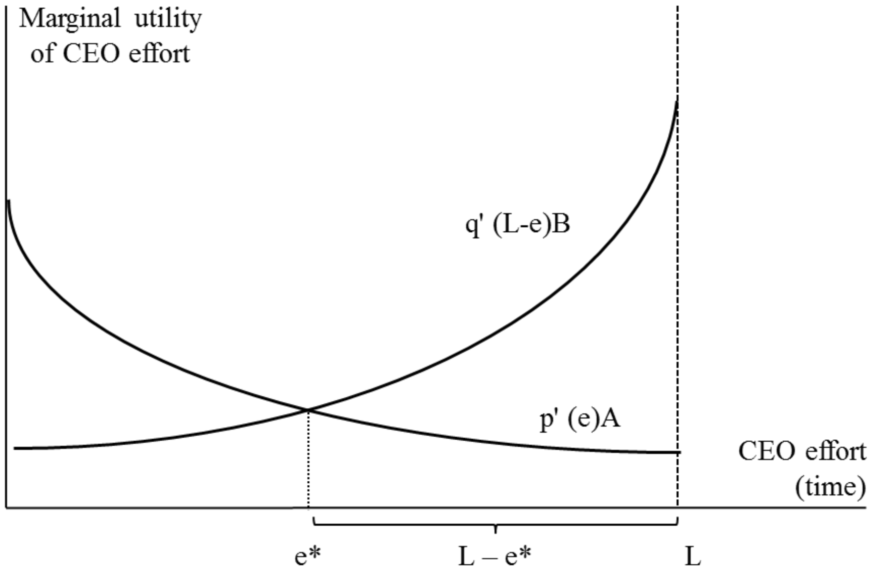
$$U = s*[p(e)*A + q(L - e)*B]$$

Solving for the CEO's allocation of her time, the first-order condition of time allocation is:

$$p'(e)*A - q'(L-e)*B = 0$$

This optimality condition can be represented in the following figure. The vertical axis of the figure is the marginal utility of the CEO's effort. The intersection of the marginal utility schedules from investing time in activity A and B yields the optimal allocation of time e* and (L – e*), respectively.

If the two activities are symmetric, the CEO splits her time in half between the two activities. Everything else equal, the amount of time spent on an activity increases with the payoff of the activity. Moreover, if the CEO's time becomes more productive in an activity, say b, in that spending more time in *b* increases the probability of a payoff more than if she spends that time in activity *a*, the CEO allocates more time to activity *b*.



Suppose now that activity *a* is working on growth options and activity *b* is working on assets in place. Growth options are operations that require new future investments. Their value is not reflected in the value of assets in place. If the firm goes public to finance the exercise of its growth options, we expect A to decline and B to increase. Hence, as the firm goes public, the CEO of the public firm spends more time on activity B than the CEO of the private firm. However, this means that the firm will dedicate less time to developing growth opportunities than it did when it was private. Note that this impact of listing is not driven by the disclosure requirements and the increased investment relations activities of public firms, nor is it caused by increased size per se. What causes the change in CEO attention is the higher marginal benefit from the time dedicated to assets in place. This effect is conceivably compounded by incentives for short-termist behavior brought about by a capital market that reacts quickly to good news (Ferreira, Manso, and Silva (2012)) and by evidence of managerial myopia (Asker, Farre-Mensa, and Ljungqvist (2013)).

As the CEO devotes less attention to developing growth opportunities, the firm will become less successful at developing such growth opportunities, particularly in areas outside its core, and employees focused on such activities will have less status in the firm. This endogenous “rigidity” is compounded by a series of organizational measures, rules of conduct, and best practice the CEO implements to take full advantage of assets in place. This evolution will also make the firm a less attractive place of employment for individuals who work on developing growth opportunities, which will decrease the payoff, A, of activity *a*. As A falls, the CEO spends even less time on activity *a*.

With this simple model, the firm becomes less successful at developing growth opportunities after it becomes public. Growth opportunities become a smaller part of its valuation and its Tobin's q falls. Over time, as the payoffs of growth options fall, the firm will increasingly attract CEOs who are good at managing assets in place rather than creating growth options. It follows that the firm will become increasingly efficient in its management of assets in place but innovation will play less of a role for the firm both because it will be optimal for its CEO to focus more assets in place and because it will not attract CEOs focused on innovation.

A number of factors can accelerate or slow down the phenomenon we describe. To start with, consider the impact of competition in the market for the goods the firm produces. With greater competition, the value of B falls. In reaction, the CEO will optimally reallocate her attention and dedicate more time to the development of growth opportunities. It follows that an increase in the competition in the market for the goods the firm produces will slow down the decrease of Tobin's q with age as the firm will develop more growth opportunities.

Competition in the market for corporate control can also affect how the CEO allocates her attention. Increased competition would seem to force the CEO to allocate her time to activities that make a successful takeover less likely. Poor performance with assets in place is much easier to assess than poor performance in generating growth opportunities. It is widely accepted that growth options involve greater information asymmetries than assets in place. Further, there are costs for the firm to disclose the current state of its efforts at generating growth opportunities. For instance, through early disclosure, it might make it easier for other firms to imitate its efforts. Hence, it will be much easier for the CEO to demonstrate ability by showing good performance for assets in place than through efforts to create growth opportunities. Pressure from the market for corporate control will therefore make it optimal for the CEO to devote more attention to assets in place than to creating growth opportunities. Hence, such pressure will accelerate the decrease of Tobin's q as the firm ages.

Yet another factor that should affect the allocation of the CEO's time is labor market competition. Young firms have the employees that enabled them to acquire growth opportunities that justified going public. Over time, however, these employees will leave or will become less productive. If the firm is limited in its ability to hire employees that generate growth opportunities but not employees that exploit assets in place, the CEO will have fewer incentives to devote attention to that activity, so that a firm will see its innovative activities fall more as it ages. Laws that limit labor market competition will make it harder to hire employees with the potential to have a large impact on a firm's growth opportunities because the current employer of such employees will better be able to prevent them from working for another firm. It seems reasonable to assume that employees that help the CEO exploit assets in place will generally be easier to hire than employees who generate growth opportunities. Hence, one would expect restrictions on labor market competition to accelerate the fall of Tobin's q as the firm ages.

II. Data

A. Sample Description

The sample consists of all listed firms with data on CRSP, COMPUSTAT, and COMPUSTAT Industry Segment between 1978 and 2009. We exclude utilities as well as firms with business segments in the financial sector (SIC 6000–6999). Similarly, we ignore firms with: (a) negative total assets or sales; (b) missing data to compute the market capitalization of equity, or with negative capitalization; (c) missing data on COMPUSTAT Segments; (d) cumulative sales on the COMPUSTAT Segment tapes which deviate by more than 1% from the total sales reported on the COMPUSTAT tapes. Since very young firms might drive the results (Fama and French (2004)), we generally omit all firms under five. This omission, however, does not change our conclusions. The final sample consists of 10,219 firms and 83,790 firm-years.

We start with 2,324 firms in 1978 and end with 1,738 firms in 2009. Turnover is remarkably high: 7,934 firms enter and 6,438 firms leave between 1978 and 2009. Some of the firms that drop from the exchanges in going-private transactions may list again years later, for example in a reverse LBO. Cao and Lerner (2009) identify 526 such transactions between 1981 and 2003. Firms that relist are typically treated as separate firms in the literature, but this practice could bias our results. We use Compustat's unique identifier (gvkey) to track companies over time in spite of name or ticker changes.

B. Firm Age

We follow Fama and French (2001) and Pastor and Veronesi (2003) and assume that firms are "born" in the year of their first appearance on the CRSP tapes. Consequently, firm age is the number of years (plus one) elapsed since the year of the company's IPO.[1] Most studies that look at firm age use the same definition. We refer to this variable as the firm's *listing age*. Shumway (2001) argues that listing age is the economically most meaningful measure of firm age, since listing is a defining moment in a company's life – it affects ownership and capital structure, multiplies growth opportunities, increases media exposure, and demands different corporate governance structures (Loderer and Waelchli (2010)). Since CRSP goes back to 1925, the oldest a firm can be at the beginning of our sample period in 1976 is 51 years, compared with 84 years at its end, in 2009. Alternatively, we also compute the number of years (plus one) elapsed since the year of incorporation and denote this variable as the firm's *incorporation age*. The information is hand-collected from *Mergent Webreports* as well as from Jay Ritter's website. Throughout the investigation, *Age* refers to a company's listing age and Age_{inc} indicates the firm's incorporation age.

On average, listing age is 17 years; the median is 13 (Table I). The distribution of firm age remains fairly stable over the sample period. Incorporation age has an average value of 34 and a median value of 25.

C. Profitability Measures and Control Variables

Table I reports descriptive statistics for all the variables in the analysis. To reduce the influence of outliers, we winsorize all variables at the 1st and the 99th percentile of their pooled distribution. The results, however, do not depend on this winsorization. Ownership structure and corporate-governance data are available for only a limited subsample of firms. All definitions are in the Appendix. To assess financial constraints (*KZ index*), we follow Lamont, Polk, and Saá-Requejo (2001), among others, and estimate the Kaplan and Zingales (1997) index. The results do not change when we replace that index

[1] More precisely, we approximate a firm's year of birth with the earliest of: (a) the year in which the firm appears on CRSP; (b) the year in which the firm is included in COMPUSTAT; and (c) the year for which we find a link between CRSP and COMPUSTAT (based on COMPUSTAT data item LINKDT). If, for example, a firm enters CRSP or COMPUSTAT in 1996, its age is one year at the end of 1996 (1+1996-1996) and five years at the end of 2000 (1+2000-1996).

with alternative measures, such as a binary variable that identifies dividend payers. Except for the correlation between listing and incorporation age, which equals 0.56, most pairwise correlation coefficients between regressors are fairly low (not tabulated), so that there is no concern about collinearity.

III. Firm Age and Growth Opportunities

The managerial attention hypothesis predicts that, since managers of listed firms have to dedicate a significant amount of their time to current operations and assets in place to generate the earnings that investors expect, their ability to innovate and create new growth opportunities is limited. Since, at the same time, the growth opportunities available at the time of listing will be used up over time, the stock of growth opportunities is expected to decrease as the firm ages. We test this prediction in this section. Pastor and Veronesi (2003) show that the market-to-book ratio of a firm falls with age and falls more rapidly early on. Our theory applies more directly to Tobin's q and we are more concerned about firms that have been public for a number of years. Our sample is larger than theirs because we do not have to require a positive book value of equity as they do.

A. Decline in Tobin's q Ratios over Time

Figure 1 shows the relation between the Tobin's q ratio and company age implied by estimating local polynomial regressions of the Tobin's q ratio on firm age using an Epanechnikov kernel function with a "rule-of-thumb" bandwidth estimator and local-mean smoothing. The advantage of this approach is that we do not impose a functional form for how Tobin's q changes with a firm's age. Figures (a) and (b) show the unconditional relation. Consistent with the hypothesis, the relation is negative regardless of whether we measure company age from the date of listing or from that of incorporation. We explore next whether the relation between Tobin's q and age holds if we control for firm characteristics. We first estimate an OLS regression with industry-year fixed-effects of Tobin's q on *Capex*, *R&D*, *Focus*, *KZ-index*, *Leverage*, *Size*, *Volatility*, and *ROA*. We define industries at the three-digit SIC level. Then, we regress these residuals on incorporation age and listing age, respectively. The resulting conditional relation between company age and Tobin's q is negative as well, no matter how we measure company age. Figures (c) and (d) show results when we control for firm characteristics.

For a formal test of the relation between age and Tobin's q, we estimate OLS panel regressions with industry-year fixed-effects and firm-clustered standard errors.[2] This approach enables us to distinguish between cohort and age effects, even though the results are qualitatively the same when we run separate cross-sectional regressions for each year as in Pastor and Veronesi (2003) (not tabulated).[3]

The results are reported in Panel A of Table II. Regressions 1 and 2 relate to the full sample. Consistent with the hypothesis, the coefficient of the natural logarithm of listing age is negative and significant. So is the coefficient of the binary variable *Old dummy*, which identifies firms older than the sample median in any given year. The same results obtain when we ignore firms younger than 5 years (regressions 3 and 4). Since young firms dominate the full sample, the following analysis omits, as we already mentioned, firms younger than 5 years in terms of listing age—the exceptions will be mentioned explicitly.

Note that, since we are controlling for firm size, our findings do not reflect declining returns to scale. Older firms do not have lower q ratios because they are larger. The age coefficient remains negative and significant, and essentially unchanged, when we estimate separate regressions for large and small firms (not tabulated).[4]

If listing demands increased attention to assets in place over time, the age effect we document should be distinct from a possible age effect the company might have experienced before listing. To test this proposition, we extend regression 3 with a variable that measures incorporation age at the time of listing (*ln*(Age_{inc} *at listing*)). Previous work shows that incorporation age at listing varies substantially over time (Jovanovic and Rousseau (2001); Fink et al. (2010)). Regression 5 shows the

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2 We do not add firm fixed-effects to our standard regression because *Age* would be collinear with year fixed effects (Age grows by 1 each year). In untabulated robustness tests, we replace *Age* with *Old dummy*. In that regression, the coefficient of *Old dummy* remains negative and significant if we include firm fixed-effects.

3 As a further control for cohort effects, we tried excluding all firms born before the start of the sample period in 1978. That exclusion does not affect the results either (not tabulated).

4 In untabulated regressions, we also used alternative measures of size, including sales and the number of employees, as well as different functional forms for the relation between size and Tobin's q. These choices do not affect the age effect we find.

results. *ln(Age_{inc} at listing)* is negative and significant, indicating that firms that list at a later stage of their life cycle have fewer growth opportunities. More importantly, however, *ln(Age)* maintains its negative and significant coefficient. We conclude that, consistent with our attention hypothesis, the listing age effect is a phenomenon which differs from or is incremental to that associated with the firm's age prior to listing.

The coefficients of the control variables are mostly in line with the extant literature across regression specifications. Capital expenditures, R&D outlays, focus, and volatility are associated with larger Tobin's q ratios (the latter result is consistent, in particular, with Pastor and Veronesi (2003)). Firm size, however, has a positive coefficient and financial frictions, as measured with the *KZ-Index*, seem to be immaterial. We also find that ROA has a negative coefficient, possibly because a high ROA increases the opportunity costs of looking for growth opportunities. Financial leverage has a negative coefficient.

Panel B uses the estimates of the regressions 1 (full sample) and 3 (subsample of firms older than 4) to assess the economic significance of the relation between age on Tobin's q. Firms in the 25th percentile of the full sample of listing age (year 4), for example, are predicted to have a q of 2.07, compared with 1.82 if they are in the 75th percentile (year 17). Hence, a time lapse of 13 years brings about a decline of 12 percent, or a steady annual decrease of almost 1 percent. Note that, if age is a noisy measure of the limited managerial attention problem, these estimates will be affected by attenuation bias.

B. Decline in Tobin's q Ratios across Industries

It is well-known that there is an industry lifecycle (Bernstein (2012)). A concern with our results is that they might just reflect that lifecycle. A simple approach to separate the industry lifecycle from the firm lifecycle is to estimate our regressions within industries. We use the 48 industries identified by Fama and French (2001) to perform this analysis. We estimate separate regressions for each of the 48 industries for which there is a sufficient number of observations (Table III). The regression specification is the same as that in column 3 of Table II, except that, since we work with industry-specific subsamples, the only fixed effects we include are year-fixed effects. Standard errors are clustered at the firm level. For simplicity, we report only the coefficient of *ln(Age)*. We use that coefficient to compute the impact on Tobin's q of a change in listing age from the 25th to the 75th percentile of the pooled distribution of age in the industry. This effect is measured relative to the average q in the industry, and is shown for statistically significant age coefficients.

The relation between age and Tobin's q is negative and significant at least at the 5% level for 24 out of the 38 industries we report, and it is negative and significant at the 1% level in 22 out of these 38 cases. The marginal impact of age is similar across industries, and it goes from about 5% (Office Supplies) to 17% (Printing and Publishing). We obtain very similar results when measuring age since incorporation. Only two industries have a positive and significant coefficient: Candy and Soda, and Textiles. Note, however, that there are only 44 candy and soda producers and 77 textile companies in the sample.

C. Inability to Revert to the Initial Success

The puzzling aspect of the relation between age and Tobin's q is the fact that firms are unable to renew their success, in spite of the fact that they can learn and that they can buy into new technologies and markets. Table IV documents this phenomenon from a slightly different perspective. Panel A performs an unconditional analysis of the 8,079 firms with the necessary number of observations by comparing the maximum Tobin's q ratios observed during the first four years after listing (denoted with q*) with the maximum ratios observed thereafter. Consistent with the inability to renew growth opportunities, these maximum ratios average 3.6 in younger firms compared with 3.0 in older firms. The corresponding median values are 2.3 and 2.1, respectively. Both differences are statistically significant with confidence at the 99% confidence level.

Following a similar logic, Figure 2 asks how likely it is that a firm will be able to exceed q* as a function of age. To filter out common effects, we measure q as the residual from a pooled OLS regression of Tobin's q on industry and year fixed-effects. The figure shows that very few firms manage to exceed their q* after year four. At age 5, for example, only 12.2% of the sample firms have a q larger than q*. This fraction more or less gradually declines to 8.3% at age 25. Moreover, we find that only 30% of the firms *ever* beat their q* (not tabulated).

Panel B of Table IV conducts an analysis of the ability to exceed q* with conditional logit regressions and industry-year fixed-effects and robust standard errors. The binary dependent variable equals 1 if the Tobin's q of the firm in question increases beyond q* in any given year, and it equals 0 otherwise. We test whether the probability of that event, among firms that are below the maximum, declines with age. The evidence is consistent with this prediction. The coefficient of our two measures of age, *ln(Age)* and *Old dummy*, is negative and significant. Interestingly, there is no evidence that research and development activities are able to slow down the decay in growth opportunities. The coefficient of an interaction term between *Old dummy* and *R&D* is statistically zero.

These findings could be affected by survivorship bias, although that would induce a gentler decline in average q ratios and therefore go against our hypothesis. Most firms disappear because of takeover (Baker and Kennedy (2002)), and firms with high growth opportunities are less likely to be taken over (Loderer and Waelchli (2013)). Hence, the best firms tend to remain, which should raise the observed Tobin's q ratios above the level we would measure without the exclusion of the firms that merged or were taken over.

IV. Managerial Attention, Competition, and the Corporate Aging

The limited managerial attention hypothesis predicts that the relation between age and Tobin's q should be more negative when competition forces management to devote more attention to assets in place and flatter when it makes it more advantageous for management to devote more attention to generating growth opportunities. In particular, as discussed in Section II, greater competition in the goods market increases the value to management from paying more attention to generating growth opportunities, so that it makes the relation between age and Tobin's q flatter. Similarly, management has to pay more attention to assets in place when there is more competition in the market for corporate control, so that the slope of the relation between Tobin's q and age is more negative. Finally, if the firm can more easily hire people who can generate growth opportunities, the expected gain to management from paying attention to generating growth opportunities is higher, so that the relation between age and Tobin's q is less negative. We test these predictions in this section.

A. Product Market Competition

Table V reports tests of the hypothesis that the relation between age and Tobin's q is less negative when product market competition is more intense.

We first measure competition with the firm-specific concentration index suggested by Hoberg and Phillips (2011). The data cover the years 1996 to 2008. During that period, we find matching information for 33,891 firm-years. We identify firms in a competitive environment if their concentration index is below the sample median concentration index in any given year (*High competition dummy*). In regression 1 of Table V, we add *High competition dummy* (lagged by 1 year) and an interaction term with *ln(Age)* to our standard regression. The evidence shows that the coefficient of age is still negative and significant. Consistent with the managerial attention hypothesis, the interaction term is positive and significant, indicating that Tobin's q falls more slowly with age in a more competitive environment.

The problem is that Tobin's q is higher for firms with more monopolistic rents (Salinger (1984)). If so, if we assume that Tobin's q ratios eventually converge towards one, the decline in Tobin's q could be more moderate in competitive environments simply because competitive environments have lower q ratios to begin with. Consistent with this argument, the coefficient of *High competition dummy* is negative and significant. To address this issue, we re-estimate the regressions with standardized Tobin's q as the dependent variable so that Tobin's q is adjusted for rents earned by firms in the subsample. Standardization means that we demean the q of a given firm by the q observed for its subsample of firms (grouped into high vs. low competition in any given year) and divide by the subsample standard deviation of q. We include the subsample's average q as an additional control variable. The results, however, do not change (regression 2).

An alternative approach to control for endogeneity is to look for exogenous competitive shocks. Guadalupe and Wulf (2010) and Frésard and Valta (2012), among others, argue that import tariff changes constitute shocks in product market competition. Tariff reductions, in particular, should increase competition. We can therefore use exogenous reductions in tariffs to test for whether the relation between a firm's Tobin's q and its age depends on competition. We use the industry-specific import tariff reductions identified by Frésard and Valta (2012). For the affected industries (at the SIC

4-digit level), we define a binary variable, *Lower tariff dummy*, that identifies industry-years after the tariff reduction. We add this variable to the standard regression and interact it with firm age. The results are shown in regression 3 of Table V. While stronger competition reduces the industry's overall level of growth opportunities, it slows down the age-related decay in Tobin's q. The same results obtain when we use standardized q ratios (grouped into pre vs. post tariff reduction cohorts in any given calendar year) as the dependent variable (regression 4). The same result also obtains when we use the binary measure of age, *Old dummy*, instead of *ln(Age)* in regression 4 (not tabulated).

B. Competition in the Market for Corporate Control

As discussed in Section 2, we expect the relation between Tobin's q and age to be more negative if competition in the market for corporate control is stronger. We test this prediction using the introduction of business combination laws as a source of exogenous variation in external corporate control regimes.

Business combination laws deter corporate control transactions by imposing a moratorium on transactions, such as mergers, between a large shareholder and the firm incorporated in a particular state as soon as the shareholder's stake exceeds a given size. Delaware, for example, enacted these statutes during the 1980s to deter hostile leveraged corporate takeovers. These laws take some of the pressure off management to make an efficient use of their assets to avoid a takeover (Bertrand and Mullainathan (2003)). Under these laws, we would therefore expect management to be able to dedicate more time to generate growth opportunities, which would imply a less significant decline in Tobin's q over time.

Table VI shows that older firms incorporated in states that passed business combination statutes during the sample period experience the predicted less rapid decline in Tobin's q ratios over time. Specifically, in column 1, we estimate our standard regression specification with the addition of *BC*, a binary variable equal to 1 if the firm is incorporated in a state that passed a business combination statute in a particular year, and equal to 0 otherwise. We also include an interaction term that combines listing age and *BC*. The numbers show that the coefficient of company age, *ln(Age)*, remains negative and significant. Moreover, the existence of a business combination law per se contributes to a lower

Tobin's q. However, the interaction of age and business combination statutes appears to slow down the decline of Tobin's q over time. Hence, as predicted, business combination laws seem to protect firms and give their managers more time to tend to growth opportunities. We obtain similar results when measuring firm age with the binary variable *Old dummy* (column 2). Since Delaware is the state of incorporation of choice, it is possible that the results reflect a Delaware-specific effect. Columns 3 and 4 therefore replicate the estimation while omitting firms incorporated in Delaware. The results, however, remain the same. Business combination laws delay the decay in Tobin's q.

C. Labor Market Competition

Cross-sectional variation in the competitive structure of labor markets should have an effect on the relation between company age and growth opportunities as well. Non-compete clauses (NCC) in employment contracts limit the ability of employees to pursue own ventures or join firms in activities related to those of their employers. These clauses are not enforced uniformly across states in the U.S. Vigorous enforcement will help young firms because they prevent employees from leaving their employer to cash in on their knowledge and ideas. In contrast, they make it difficult for older firms to find creative employees. Hence, companies located in states that allow and enforce non-compete clauses in employment agreements should experience a quicker decline in Tobin's q ratios over time.

We test this prediction in Table VII. The proxy for the enforcement of noncompetition agreements is the noncompetition enforcement index from Garmaise (2011), which is based on data provided by Malsberger (2004). The index aggregates the answers to 12 questions about the enforcement of specific dimensions of noncompetition law in the state where the firm is headquartered. A high index value measures stricter enforcement. Regression 1 adds the non-competition index to our standard specification. Age maintains a negative and significant coefficient whereas the index is unrelated to Tobin's q. In regression 2, we add an interaction term between the index and the binary measure of firm age. The interaction term has the predicted negative coefficient. Consequently, firms headquartered in states where NCCs are enforced more rigorously appear to run out of growth opportunities more quickly. The results are qualitatively the same when we use *ln(Age)* instead of the binary age measure. In what follows, for reading convenience and to preserve space, we only report interaction terms with the binary age measure.

V. Managerial Attention and Strategic Focus in Older Firms

With our theory of managerial attention, as a firm gets older, it loses the ability to regenerate itself through the development of new growth opportunities. Management cannot expect that the firm will perform better because of exercising growth options. As a result, it has to focus more and more on the activities where it has its greatest comparative advantage. Therefore, we expect older firms to become more focused, to have less uncertainty, and to be more efficient in managing assets in place. Having paid less attention to the generation of growth opportunities early on, older firms should also increasingly lose the skills to generate such opportunities. Barring agency problems, older companies should therefore reduce their investment outlays, especially for R&D. We test these predictions in this section.

A. Increased Focus

Panel A of Table VIII reports coefficients from conditional logit regressions of the likelihood of asset sales against our usual control variables and firm age. In regression 1, the binary dependent variable identifies firms that engage in an asset sale (*Asset sale dummy*). In this regression, the coefficient of the binary measure of listing age, *Old dummy*, is positive and significant. As predicted, older firms are more likely to dispose of assets.

Regression 2 identifies firms that sell core assets (*Core asset sale dummy*). A sale is core if the target and the acquiring company have the same 3-digit SIC codes. In contrast to that, regression 3 focuses on sales of non-core assets (*Non-core asset sale dummy*), which occur when the target and the acquiring company have different 3-digit SIC codes. According to the results, the probability that older firms dispose of non-core assets is significantly higher than that of unwinding core assets. Hence, strategic focus does increase over time. Finally, regression 4 replicates regression 3 conditional on the subsample of firms that actually engage in asset sales. The results confirm that older firms are more likely to dispose of non-core assets.

Though a common view of diversification is that firms diversify to replace exhausted growth opportunities, Arikan and Stulz (2012) show that more mature firms are not more likely to make diversifying acquisitions than younger firms. If firms do not diversify more but sell more unrelated activities as they mature, we should find that the number of reported industrial segments fall as firms become older. We therefore estimate conditional logit regressions of the likelihood of a reduction in the number of reported segments with the same regression specification as that used in Panel A. According to the results, older firms are indeed significantly more likely to reduce the number of reported segments. An important caveat with this result is that firms can assign business units to segments strategically and that, during our sample period, there were changes in the rules that firms have to follow in assigning business units to segments.

B. Decline in Uncertainty

Table IX investigates the relation between firm age and investor uncertainty with OLS regressions with industry-year fixed-effects and firm-clustered standard errors. Investor uncertainty is approximated with asset volatility, namely a weighted average of equity and debt volatility (see Bharath and Shumway (2008)). The estimation shows that investor uncertainty does decline over time (see also Pastor and Veronesi (2003)), regardless of how we measure listing age. This finding is consistent with the hypothesis that firms focus and thereby reduce the perceived complexity of what they do.

C. Increased Technical Efficiency

We argue that firms focus to exploit their earnings potential, to make their products and services more attractive, and to lower costs. Table X tests whether the focusing effort pays off and allows older firms to become technically more efficient. We examine three different measures of technical efficiency, namely a sales/book-value-of-assets ratio, a sales/assets-in-place ratio, and the ratio of cost of goods sold (COGS) per number of employees. The analysis takes the usual form of OLS regressions with industry-year fixed effects and firm-clustered standard errors. The evidence is in line with the predicted increase in technical efficiency in older firms. Keeping everything else the same, older firms generate significantly more sales per dollar of assets invested, regardless of whether we use a book measure of those assets or Richardson's (2006) measure of assets in place. Companies also achieve significantly lower COGS per employee over time.

D. Age and Current Profitability

We would expect older firms to also experience better profitability, at least initially, as they improve their technical efficiency. Eventually, as a result of competition and the inability to innovate, profitability should decline. To investigate this prediction, we estimate nonparametric regressions similar to those shown for Tobin's q in Figure 1. The results in Figure 3 reveal that ROA indeed increases initially until about year 12 after the IPO. Thereafter it falls relative to the industry average. In untabulated regressions, we find that the eventual decline in ROA is not compensated by bigger volume. Older firms grow more slowly and their market share actually shrinks over time. We also find that the sales growth of older firms is more likely to be negative than in other firms.

The question is whether the profitability decline continues and ultimately turns into a financial loss, or whether it simply reflects the "strong presumption in economics that profitability is mean reverting" to the industry-wide level (see Rajan, Servaes, and Zingales (2000)). Consistent with the latter prediction, we find that the probability that a firm will have a year with negative ROA falls with age (not tabulated).

E. Age and Investment Policy

We argued that, as firms aim at being the best in their current operations, they have less time to dedicate to developing activities outside their core business and their ability to innovate will fall. If so, they will be less likely to innovate. Hence, barring agency problems, we expect older firms to invest less to generate new growth opportunities. Their capital expenditures should be comparatively lower and they should engage less actively in R&D activities.

Table XI investigates different measures of investment outlays and tests whether they grow with company age. We consider capital expenditures and R&D expenditures. These investment measures are standardized with sales and regressed on listing age and the usual set of control variables using

OLS with industry-year fixed-effects and firm-clustered standard errors. The coefficients on our age measure are all negative and significant regardless of whether we measure age with the natural logarithm of age or with the binary variable that identifies older firms.

VI. Alternative Hypotheses

As predicted by our managerial attention hypothesis, we find a negative relation between company age and growth opportunities. The relation is highly significant and quite robust with respect to different estimation techniques, regression specifications, and the way we measure firm age. In this section, we investigate three competing explanations of the negative relation between age and Tobin's. According to these explanations examined in turn, the negative age relation between age and Tobin's q could be the result of the relaxation of financial constraints over time, of increased managerial agency problems in older firms, and of firm management age.

A. Aging and Financial Constraints

Over time, investors learn more about firms and their business models and not surprisingly investor uncertainty declines. This loosens the financial constraints of firms over time and improves their access to capital markets. Consistent with these predictions, Hadlock and Pierce (2010) find that company age is a particularly useful predictor of financial constraints. Neoclassical theory predicts that firms with limited capital and a given set of investment opportunities undertake the most profitable investments first (Cooley and Quadrini (2001)). If so, it is not surprising to observe that older firms have lower Tobin's q ratios—although the puzzling observation of their inability to regenerate their investment opportunity set remains. Table XII tests whether financial constraints are indeed responsible for at least part of the aging effect we uncover.

To investigate, we use the payouts to shareholders as a proxy for financial constraints. We then test whether firms that are financially constrained experience a stronger decline of Tobin's q over time—firms that are financially unconstrained are able to fund the investment opportunities they want, hence, in their case, their average Tobin's q will be lower and less negatively declining (the assumption is that q ratios converge monotonically to 1). Whereas Panel A focuses on dividend payouts, Panel B looks at total cash payouts (dividends plus share repurchases).

In regression 1 of Panel A of Table XII, we expand the standard regression specification with a binary variable that distinguishes dividend payers from non-payers in any given year (*Dividend dummy*). In addition, we interact this variable with the binary measure of age (*Old dummy*). In this specification, firm age has, as before, a negative and significant coefficient. Neither the coefficient of *Dividend dummy* nor that of the interaction term is statistically significant at conventional levels of significance. Hence, there is no evidence that financial constraints are responsible for the age effect we find. We reach the same conclusion when we re-estimate the regression 1 but look back at listing age 5 (*Dividend 5 dummy*) to distinguish between dividend payers and non-payers (regression 2). Under this specification, *Dividend 5 dummy* is negative and significant, indicating that financially unconstrained firms do indeed have lower qs. However, the variable *Old dummy* maintains a negative and significant coefficient and the interaction term remains statistically zero.

To examine this latter result more closely, we split the sample by whether firms paid dividends at listing age 5 and estimate our regression equation for the two subsamples separately. This allows for different regression coefficients for all arguments. There is no difference, however, in the age coefficients in the two subsamples. We therefore conclude that financial constraints cannot be responsible for the decline in Tobin's q ratios over time.

Our conclusions do not change in Panel B, which repeats the analysis of Panel A, except for including share buybacks in the cash payouts to shareholders, as defined in Skinner (2008). The age coefficient remains negative and significant across all regression specifications. Moreover, the interaction term between financial constraints and company age has never a statistically significant coefficient. Note that financial constraints per se are related with Tobin's q only when we look at the contemporaneous payouts (as opposed to those at age 5).

B. Agency Problems in Older Firms

The decrease in Tobin's q with firm age could reflect agency problems between managers and firm owners that intensify as time goes by. Managers could have a preference for a quiet life and therefore decide to work less, steer away from risky investment and R&D projects, and simply milk the available lines of business. This quiet life hypothesis (Hicks (1935); Bertrand and Mullainathan (2003); Giroud and Mueller (2010)) could explain some of the observations we make, such as the decline in Tobin's q, the decline in asset volatility, the reduction in investment and R&D activities, and the impact of competition. Yet it cannot explain why technical efficiency increases over time. A quiet life, however, is only one possible manifestation of managerial conflicts of interest. We therefore test whether older firms are more likely to have principal-agent problems, and whether that explains the impact of company age on Tobin's q. Moreover, since older firms invest less, we want to see whether we find any evidence of cash redistribution or dissipation. We investigate whether the compensation of CEOs at older firms is higher and whether older firms return cash to shareholders. We also ask whether they end up accumulating larger cash balances.

B.1. Age, Corporate Governance, and Tobin's q

Table XIII examines whether older firms are more prone to experience managerial agency problems. In Panel A, we therefore sort firms into old and young, and compare the values of various governance indices that have been suggested in the literature, namely the *GIM index* developed by Gompers, Ishii, and Metrick (2003), the delay index (*Delay index*) suggested by Kadyrzhanova and Rhodes-Kropf (2011), and the alternative takeover protection index (*AT index*) proposed by Cremers and Nair (2005). We also compare *Board size* and *Executive ownership.* According to this univariate analysis, older firms rank significantly higher on the indices of managerial entrenchment. They also have significantly larger boards and lower managerial stockholdings. Older firms could therefore be affected by more serious agency problems.

In Panel B, we test whether these apparent problems could be responsible for the fewer growth opportunities generated by older firms. We therefore extend the standard regression of Tobin's q with the proxies for management entrenchment. If the negative age coefficient is the consequence of agency problems, it should lose its statistical significance in this regression specification. The entrenchment variables are available only for relatively large and mature firms, as evidenced by the fact that the median listing age in this group of firms is 21, as opposed to 13 in the full sample. The binary measure of company age is therefore redefined to denote firms older than 21 years of listing age. Moreover, since the sample of firms with the necessary data yields only 3,631 firm-years in 1,072 possible industry-year combinations, we drop industry-year fixed-effects from the regression specification and replace them with separate industry (138) and year (12) fixed-effects. For simplicity, we do not report the coefficients of the standard control variables and focus only on age and governance. Under the new specification, the age coefficient remains negative and significant, regardless of whether age is measured with the natural logarithm of the number of years since listing or with the new binary variable. This finding rejects the hypothesis that conflicts of interest are responsible for the decline of Tobin's q ratios over time.

Panel C provides an alternative test of the corporate governance hypothesis. Instead of including all the governance indices in the regression specification, we include them one at a time. We also include interaction terms of governance and company age. Even under this specification, however, the coefficient of company age remains generally negative and significant. The exception is in the case of the GIM index, in which neither company age nor governance index have significant coefficients. Note that no interaction term has a significant coefficient in any of the regressions. There is, consequently, no evidence that agency problems are responsible for the comparatively low growth opportunities in older firms.

B.2. Age and CEO Compensation, Cash Payouts, and Cash Holdings

We also find little evidence of greater wealth redistribution and wealth dissipation as firms age. Specifically, we use the model of Core, Guay, and Larcker (2008) to see whether CEO pay is higher in older firms (Panel A of Table XIV). The dependent variable in these regressions is the log of the CEO's total compensation (ln(*CEO total pay*)). Regression 1 replicates the model of Core, Guay, and Larcker (2008). Regressions 2 and 3 add firm age as an additional control. Contrary to the prediction of wealth redistribution, however, CEO pay does not increase with the firm's age. In fact, the opposite is true. CEOs make less money in older firms, possibly because they are less productive. Hence, if there are more serious agency problems in older firms, they manifest themselves in ways other than higher CEO pay. The fact that the CEOs of old firms make less money suggests that the negative age effect on q could be driven by CEO talent. Yet, when we control for CEO compensation (the implied proxy for talent), the relation between age and q is still negative and significant.

Since older firms seem to be unable to generate new growth opportunities, we want to know what they do with their excess cash. Poor governance would imply cash retention. We therefore test the null hypothesis of whether older firms are less likely to be dividend payers. The test is implemented as a conditional logit regression with industry-year fixed effects and robust standard errors. The results reject the null (not tabulated). In a second step, we use OLS regressions with industry-year fixed effects and firm-clustered standard errors to test whether older firms have lower payout ratios. The evidence in the first two columns of Panel B rejects that prediction as well. Older firms have actually higher payout ratios. Since dividends are not the only form of payout to shareholders, we also test whether older firms have comparatively lower total payout ratios, where total payouts are dividends plus share repurchases. The evidence rejects this prediction, too (columns 3 and 4 of the table). Older firms make higher payouts to shareholders. Finally, we inquire into whether older firms hold higher cash balances, yet the evidence shows that the opposite is true (columns 5 and 6 of the table).

Overall, older firms do not give their CEOs a higher pay. If anything, they grant them a lower compensation. At the same time, they return cash to their shareholders and hold lower cash balances. There is therefore no evidence of wealth redistribution in the form of higher CEO compensation or of wealth dissipation.

C. Company Age versus Management Age in Older Firms

Company age could be a proxy for management age or tenure. Consistent with that possibility, Table XV shows that both CEO age and tenure are significantly higher in older firms. Directors are older and have longer tenure, too. The differences, however, are not very large. The directors of old firms, for example, are 64.5 years of age on average; in young firms, they are 61. The corresponding tenure numbers are 10.5 versus 8.3. A multivariate analysis in which we estimate our standard panel regression with CEO age as the dependent variable confirms that CEO age is positively correlated with company age even conditionally (not tabulated). However, management age or tenure cannot explain the negative relation between company age and Tobin's q. A look back at Panel B of Table XIII shows that adding CEO and director age and tenure does not erase that negative relation.

VII. Conclusions

This paper develops and tests a managerial attention theory which predicts that Tobin's q falls with age and that factors that increase (decrease) management's attention to assets in place as opposed to generating growth options accelerate (slow down) the fall of Tobin's q with age. We predict that increased competition in the goods market forces management to devote more attention to generating growth options because the assets in place become less valuable. Using exogenous changes in competition brought about by tariff reductions, we find that increases in competition do reduce the negativity of the relation between Tobin's q and firm age. In contrast, increased competition in the market for corporate control leads management to pay more attention to assets in place. As predicted, exogenous changes that decrease competition in the market for corporate control make the relation between Tobin's q and age flatter. Finally, greater competition in the labor market makes it easier for firms to hire individuals who can help with generating growth opportunities. As a result, management devotes more attention to generating growth opportunities and the relation between Tobin's q and age is flatter. This paper contributes to our understanding of how firms age, how they invest, how they are valued, and how they are affected by agency problems.

It follows from the managerial attention theory that firms increasingly focus on their core activities over time and in the process invest less, are less active in R&D, and are more likely to divest assets. We find strong evidence supporting these predictions as well. Even though older firms might have more significant agency problems between shareholders and managers (they have larger boards and lower executive stock ownership), older firms return cash to shareholders and do not grant their CEOs compensation that is larger than usual. Moreover, there is no evidence that agency costs are responsible for the decay in growth opportunities over time. Finally, we find that our findings are not due to older firms having managers with longer tenure.

Appendix. Variable Definitions

Variable	Definition
	Panel A: Firm age
Age	Listing age, computed as one plus the difference between the year under investigation and the firm's birth year. The birth year is computed as the minimum value of: (a) the first year the firm appears on the CRSP tapes; (b) the first year the firm appears on the COMPUSTAT tapes; and (c) the first year for which we find a link between the CRSP and the COMPUSTAT tapes;
Age_{inc}	We also compute age as the number of years (plus one) since incorporation. This information is from Jay Ritter's Website as well as from Mergent Webreports;
Age_{inc} at listing	The firm's incorporation age (Age_{inc}) at the time of listing;
Old dummy	Binary variable equal to 1 if the firm in question is older (in terms of listing age) than the sample median in any given year, and equal to 0 otherwise;
	Panel B: Profitability, productivity, and growth opportunities
COGS/Employee	The firm's COGS (cogs) divided by the number of employees (emp);
ROA	Return on assets is the ratio of the firm's operating income before depreciation (oibdp) divided by the lagged book value of total assets (at). The data are from COMPUSTAT;
Sales/Assets	The firm's sales (sale) divided by the book value of assets at the beginning of the year (at);
Sales/VAIP	The firm's sales (sale) divided by the value of the assets in place. VAIP is the value of the assets in place, as defined in Richardson (2006): $VAIP = (1\text{-}ar)BV + a(1+r)X - ard$, Where BV is the book value of common equity (ceq), X is earnings (oiadp), d is dividends (dvc), r is the discount rate (12%), and a is w/(1+r-w). w is a fixed persistence parameter with a value of 0.62, as reported in Scharfstein and Stein (2000).
Tobin's q	Tobin's q, computed as the market value of the firm's assets (Size) divided by their book value (at). The data are from COMPUSTAT;
	Panel C: Other firm-specific variables
Asset sale dummy	Binary variable that identifies firms that engage in an asset sale. The data is from SDC platinum;
Asset volatility	Asset volatility is the weighted average of equity volatility and debt volatility. Debt volatility is assumed be 5% + 0.25*Volatility. The weights are the ratio of book equity and book debt in the firm's capital structure (defined as sum of book value of debt and equity). See Bharath and Shumway (2008);
Analyst uncertainty	The standard deviation of the 2-year EPS analyst forecasts, divided by the book value of equity (per share);
BC dummy	Binary variable equal to 1 if the firm is incorporated in a state that has passed a business combination law.
Capex	The ratio of capital expenses (capx) net of depreciation and amortization charges (dp) to sales (sale). The data are from COMPUSTAT;
Cash holdings	The firm's cash balance (che) divided by the book value of assets;
Core asset sale dummy	Binary variable that identifies sales of core assets. Such a sale is assumed if the target and the acquiring company have the same 3-digit SIC codes;
Dividend dummy	Binary variable that identifies firms that pay dividends;
Dividend 5 dummy	Binary variable that identifies firms that paid dividends at age 5;
Focus	The Herfindahl index, HE, captures the degree of specialization based on the sales in the firm's different segments, as reported on the COMPUSTAT Segment tapes: $H_E = \sum_{i=1}^{N} p_i^2$, where N is the number of segments, the subscript i identifies the segments, and pi is the fraction of the firm's total sales in the segment in question;
High competition dummy	Binary variable that identifies firms in industries with low concentration (Sales-weighted HH-index) < median industry concentration in any given year;
KZ-index	The Kaplan and Zingales (1997) index that measures a firm's level of financial

	constraints. We follow Lamont, Polk, and Saá-Requejo (2001, p. 552) and compute the KZ index as: –1.001909×[(ib+dp)/ppentt-1] + 0.2826389×[(Size)/at] + 3.139193×[(dltt+dlc)/(dltt+dlc+seq)] – 39.3678×[(dvc+dvp)/ppentt-1] – 1.314759×[che/ att-1]. The data are from COMPUSTAT;
Leverage	Leverage is the firm's long- and short-term debt (dltt+dlc) divided by the market value of assets (Size). The data are from COMPUSTAT;
Lower tariff dummy	A binary variable that identifies industry-years after a reduction in import tariffs. The data are from Frésard and Valta (2012).
MTB-equity	The market-to-book ratio is the ratio of the firm's market value of equity (csho×prcc_f) divided by the book value of common equity (ceq). The data are from COMPUSTAT;
Non-core asset sale dummy	Binary variable that identifies sales of non-core assets. Such a sale is assumed if the target and the acquiring company have different 3-digit SIC codes;
Noncompetition index	The noncompetition enforcement index from Garmaise (2011), which is based on the data provided by Malsberger (2004). The index aggregates the answers to 12 questions about the enforcement of specific dimensions of noncompetition law in the state where the firm is headquartered. The data start in 1992.
Payout	The firm's payout ratio is the ratio of total dividend payments (dvp+dvc) divided by the firm's operating income before depreciation (oibdp). The data are from COMPUSTAT;
Payout dummy	Binary variable that identifies firms that pay dividends or repurchase shares. Share repurchases are defined as in Skinner (2008);
Payout 5 dummy	Binary variable that identifies firms with *Payout dummy* = 1 at age 5;
Reduction in reported segments dummy	Binary variable that identifies firms that reduce the number of reported segments on Compustat;
sp500 dummy	Binary variable that identifies S&P500 firms;
R&D	The firm's R&D expenses (xrd) divided by its sales (sale). The data are from COMPUSTAT;
Size	Size, the log of market value of the assets at the beginning of the year, is approximated by the book value of assets (at) minus the book value of common equity (ceq) plus the market value of common equity (csho×prcc_f) minus deferred taxes (txtb). The data are from COMPUSTAT;
Stock return	The firm's annual stock return, computed as (prcc_f+dvpsx)/l.prcc_f - 1. The data are from COMPUSTAT;
Total payout	The firm's total payout to shareholders divided by operating income (oibdp). Total payout is the sum of dividend payment (dvp + dvc) as well as share repurchases, as defined in Skinner (2008);
Volatility	The volatility of the firm's monthly stock return. We calculate the volatility over a five-year window and include all firm-years with at least 24 monthly returns. The data are from the monthly CRSP tapes;

Panel D: Management team

Board size	The number of directors who serve on the firm's board. The data are from IRRC;
CEO age	The age of the firm's CEO, measured in years. The information is from ExecuComp;
CEO tenure	The tenure of the firm's CEO, measured in years. The information is from ExecuComp;
CEO total pay	The CEO's total compensation, expressed in thousands of 2009 USD. The data are from ExecuComp;
Director age	The average age of the firm's directors, measured in years. The information is from Risk Metrics;
Director tenure	The average tenure of the firm's directors, measured in years. The information is from Risk Metrics;
Executive ownership	The cumulative fraction of shares controlled by the firm's officers. The data are from ExecuComp;

Panel E: Governance provisions

Alternative takeover index	The alternative takeover protection index, as suggested by Cremers and Nair (2005);
Delay index	An index of the four delay provisions in the GIM index (Kadyrzhanova and Rhodes-Kropf (2011));
GIM index	The firm's score on the governance index from Gompers, Ishii, and Metrick (2003). The index is provided on a bi- or triannual basis. To increase sample size, we interpolate the index for missing sample years. The data are from RiskMetrics.

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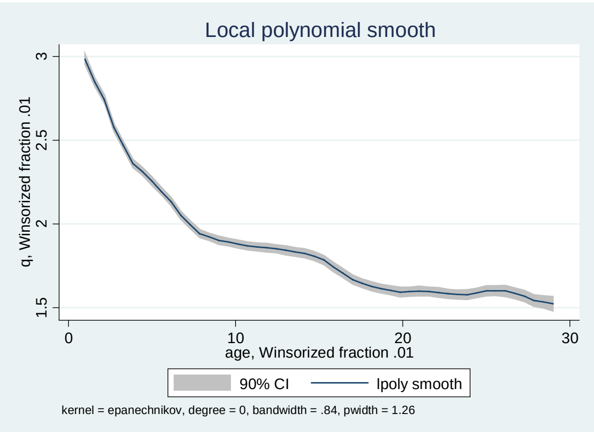
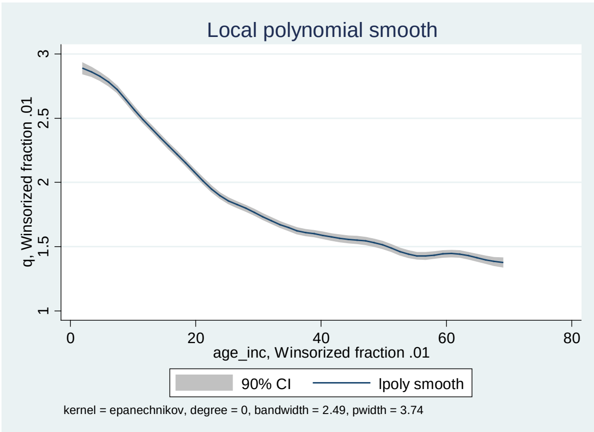
Figure 1

Firm Age and Tobin's q

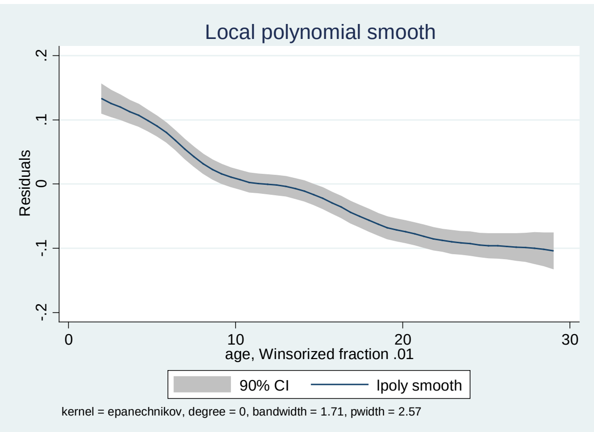
The figure shows the relation between Tobin's q ratios and company age implied by nonparametric regressions. The solid lines in the figures are obtained from local polynomial regressions of Tobin's q ratios on firm age using an Epanechnikov kernel function with a "rule-of-thumb" bandwidth estimator and local-mean smoothing. The shaded area shows the 90% confidence interval. Figures (a) and (b) show the unconditional relation and measure age since listing and incorporation, respectively. To obtain Figures (c) and (d), we first estimate an OLS regression with industry-year fixed-effects of Tobin's q on Capex, R&D, Focus, KZ-index, Leverage, Size, Volatility, and ROA. We then regress these residuals on listing and incorporation age, respectively. Listing age is restricted to between 1 and 30 years, incorporation age is restricted between 2 and 70 years. The sample period is 1978 – 2009.



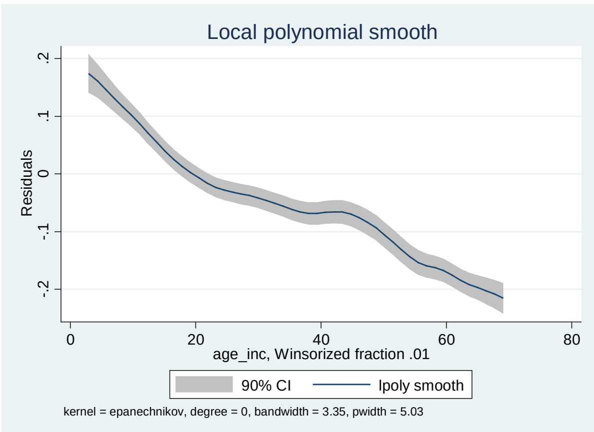
(a) Unconditional (Listing age; Full sample)



(b) Unconditional (Incorporation age; Full sample)



(c) Conditional (Listing age; Full sample)



(d) Conditional (Incorporation age; Full sample)

Figure 2

Probability of Regenerating Growth Opportunities in Early Years

The following figure shows the fraction of firms with q > q*, sorted by age cohort. q* is the maximum ratio observed during the years 1 to 4 after listing. To adjust for common effects, the q ratios we use are the residuals from a pooled OLS regression of q on industry and year fixed-effects. The sample period is 1978 – 2009.

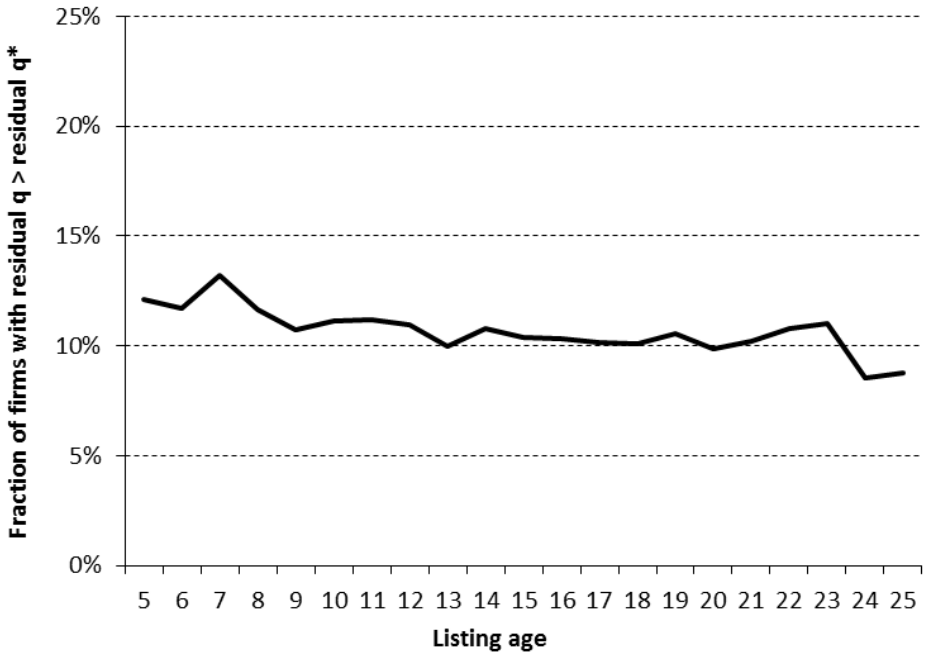
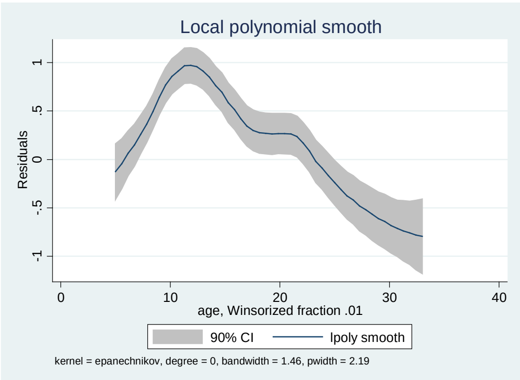


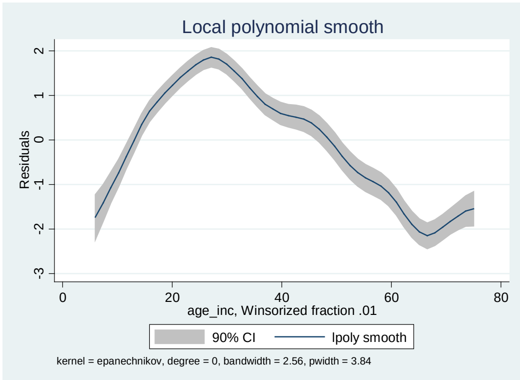
Figure 3

Firm Age and ROA

The figure shows the relation between ROA and company age implied by nonparametric regressions. The solid lines in the figures are obtained from local polynomial regressions of residual ROA on firm age using an Epanechnikov kernel function with a "rule-of-thumb" bandwidth estimator and local-mean smoothing. The shaded area shows the 90% confidence interval. Residual ROA is obtained from an OLS regression with industry-year fixed-effects of *ROA* on *Capex*, *R&D*, *Focus*, *KZ-index*, *Leverage*, *Size*, *Volatility*, and *Market-to-Book*. The sample period is 1978 – 2009.



ROA and listing age



ROA and incorporation age

Table I

Summary Statistics

This table presents summary statistics. Variable definitions are in the Appendix. The summary statistics omit firms with listing age < 5, as most of the empirical investigation will also exclude these firms. The sample period is 1978 – 2009.

Variable	Mean	Median	SD	Min	Max	Observations
			Age			
Listing age	17.45	13.00	13.91	5.00	85.00	83,790
Incorporation age	34.44	25.00	26.01	5.00	193.00	69,982
			Growth opportunities and profitability			
Tobin's q	1.785	1.301	1.455	0.559	9.599	83,790
ROA	9.757	12.526	20.222	–83.277	53.554	83,102
			Productive efficiency			
Sales/Assets	1.422	1.251	0.981	0.033	5.462	83,205
Sales/VAIP	2.626	2.029	5.717	–23.712	32.418	82,915
COGS/Employee	189.4	120.8	228.3	13.1	1,531.8	81,709
			Asset sales			
Asset sale dummy	0.093	0.000	0.290	0.000	1.000	72,310
Core asset sale dummy	0.039	0.000	0.193	0.000	1.000	72,310
Non-core asset sale dummy	0.063	0.000	0.244	0.000	1.000	72,310
			Investments			
R&D/Sales	0.312	0.033	1.429	0.000	12.131	49,927
Capex/Sales	0.027	0.003	0.166	–0.479	1.115	82,736
			Payout policy			
Dividend	0.055	0.000	1.624	–207.9	188.0	83,606
Dividend dummy	0.412	0.000	0.492	0.000	1.000	83,606
Total payout	0.014	0.000	31.510	–8,088.6	758.1	67,279
Total payout dummy	0.561	1.000	0.496	0.000	1.000	67,375
			Agency costs			
CEO pay	4,574.6	2,493.7	5,957.0	268.6	36,468.4	15,473
Cash holdings	0.153	0.074	0.187	0.000	0.840	83,787
			Additional control variables			
Focus	0.836	1.000	0.241	0.245	1.000	83,790
KZ-Index	–1.142	0.240	8.472	–58.455	20.455	82,558
Leverage	0.192	0.147	0.184	0.000	0.727	83,532
MTB-equity	2.475	1.627	3.736	–9.006	24.042	83,787
Size	2,076.5	236.1	6,101.4	4.5	44,174.3	83,790
Volatility	0.152	0.140	0.066	0.050	0.362	81,874

Table II

Firm Age and Tobin's q

The table investigates the relation between company age and Tobin's q. Panel A estimates OLS panel regressions with industry-year fixed-effects and firm-clustered standard errors. Regressions 1 and 2 relate to the full sample of firms. Regressions 3, 4, and 5 exclude firms with listing age younger than 5. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. Panel B uses the estimates of the regressions 1 and 3 to compute the impact of company age on Tobin's q. The sample period is 1978 – 2009.

Panel A: OLS panel regressions

	Dependent variable: Tobin's q				
	Full sample		Subsample with listing age >4		
	(1)	(2)	(3)	(4)	(5)
ln(Age)	–0.177***		–0.168***		–0.152***
	(0.014)		(0.018)		(0.021)
Old dummy		–0.173***		–0.145***	
		(0.019)		(0.018)	
ln(Age_{inc} at listing)					–0.080***
					(0.011)
ROA	–0.010***	–0.010***	–0.004***	–0.004***	–0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capex	0.113***	0.125***	0.268***	0.279***	0.294***
	(0.037)	(0.037)	(0.070)	(0.070)	(0.0081)
R&D	0.071***	0.072***	0.136***	0.136***	0.126***
	(0.011)	(0.011)	(0.021)	(0.021)	(0.022)
Focus	0.432***	0.499***	0.376***	0.414***	0.354***
	(0.039)	(0.039)	(0.038)	(0.038)	(0.044)
KZ-index	0.001	0.002	–0.003	–0.003	–0.001***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	–2.787***	–2.799***	–2.379***	–2.383***	–2.454***
	(0.055)	(0.055)	(0.056)	(0.056)	(0.064)
Size	0.187***	0.177***	0.173***	0.165***	0.183***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Volatility	4.086***	4.320***	4.528***	4.656***	4.314***
	(0.205)	(0.203)	(0.212)	(0.210)	(0.244)
Constant	0.854***	0.484***	0.698***	0.312***	0.838***
	(0.077)	(0.069)	(0.084)	(0.067)	(0.104)
Industry-year FE	Included	Included	Included	Included	Included
Observations	87,437	87,437	68,611	68,611	55,893
Adjusted R2	0.299	0.296	0.319	0.318	0.316

Panel B: The impact of company age

	Age percentile				
	5th	25th	Median	75th	95th
		Full sample			
Listing age	1	4	9	17	41
Implied q	2.318	2.072	1.929	1.817	1.661
		Subsample with Listing age > 4			
Listing age	5	8	13	22	50
Implied q	1.937	1.858	1.777	1.687	1.551

Table III

Age and Tobin's q: Industry-Specific Regressions

We estimate separate regressions for each of the 48 industries identified by Fama and French (2001). We exclude industries, such as agriculture, with an insufficient number of observations. The regression specification is the same as that in column (3) of Table II, except we only have year-fixed effects. Standard errors are clustered at the firm level. The column labeled "marginal impact" computes the change in q if listing age goes from the 25th to the 75th percentile of the pooled age distribution in the industry. The impact is measured relative to the average q in the industry, and is shown only for statistically significant age coefficients. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Firm years	Age (Average)	q (Average)	Coefficient of Ln(Age)	Marginal Impact
Food Products	1,118	19.5	1.54	0.021	—
Candy & Soda	419	29.6	2.05	0.603***	54.2%
Beer & Liquor	173	18.2	1.19	0.039	—
Recreation	1,033	17.7	1.45	–0.022	—
Entertainment	2,035	15.0	1.62	–0.139***	–8.6%
Printing and Publishing	336	15.4	1.63	–0.293***	–17.4%
Consumer Goods	2,143	21.8	1.54	–0.157***	–9.7%
Apparel	1,086	19.0	1.33	–0.186***	–13.1%
Healthcare	1,722	12.6	1.84	–0.108	—
Medical Equipment	3,514	15.4	2.65	–0.262***	–8.6%
Pharmaceutical Products	3,767	13.0	3.62	0.107	—
Chemicals	1,467	23.1	1.86	–0.191***	–11.6%
Rubber and Plastic Products	881	17.6	1.39	–0.027	—
Textiles	487	20.3	1.07	0.181***	15.5%
Construction Materials	1,737	21.5	1.26	–0.123***	–9.6%
Construction	644	16.1	1.22	–0.019	—
Steel Works Etc.	1,076	24.6	1.17	–0.027	—
Fabricated Products	459	19.4	1.21	–0.206***	–15.5%
Machinery	4,238	19.8	1.51	–0.160***	–10.8%
Electrical Equipment	1,521	19.0	1.71	–0.168***	–10.0%
Automobiles and Trucks	1,742	23.9	1.34	–0.083***	–7.0%
Aircraft	614	26.6	1.39	–0.063	—
Shipbuilding, Railroad Eq.	213	32.8	1.20	–0.108	—
Defense	235	34.4	1.33	–0.085	—
Precious Metals	386	14.9	2.21	0.062	—
Petroleum and Natural Gas	3,649	14.8	1.60	–0.119***	–7.4%
Communication	1,853	15.0	1.72	–0.117***	–6.4%
Personal Services	893	16.0	1.70	–0.248**	–13.4%
Business Services	12,031	14.7	2.05	–0.212***	–9.8%
Computers	4,603	13.6	2.06	–0.236***	–10.2%
Electronic Equipment	6,388	16.1	1.87	–0.180***	–9.3%
Measuring and Control Eq.	3,258	18.0	1.74	–0.307***	–16.5%
Business Supplies	1,025	20.6	1.40	–0.093**	–5.4%
Shipping Containers	186	23.7	1.02	–0.092***	–10.6%
Transportation	2,225	19.4	1.31	–0.209***	–15.7%
Wholesale	5,174	19.1	1.33	–0.096***	–7.3%
Retail	5,977	18.7	1.45	–0.162***	–10.5%
Restaurants, Hotels, Motels	2,212	17.2	1.45	–0.117***	–7.4%

Table IV

Firms' Ability to Return to the Initial Success

This table investigates whether mature firms are able to replicate their initial growth opportunities. For the 8,079 firms with sufficient data in our dataset, Panel A reports descriptive statistics for the maximum value of Tobin's q before and after listing age 5, respectively. Panel B asks whether the firms' probability of exceeding the maximum initial q measured during the first 4 years of listing age is a function of age. The dependent variable is a binary variable that identifies firms that switch from below the maximum initial q to above the maximum initial q. The subsample of firms we analyze are those with a Tobin's q below the maximum initial q. We estimate conditional logit regressions with industry-year fixed-effects and robust standard errors. All control variables are lagged by one year. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

Panel A: Univariate analysis

	Maximum Tobin's q	
	Listing age 1 to 4	Listing age 5 and older
mean	3.6	3.0
p50	2.7	2.1
min	0.5	0.6
max	47.1	9.6
sd	4.5	2.4
N	8,079	8,079
Mean comparison t-test	14.386***	

Panel B: Switching probability from below to above the maximum initial q

	Dependent variable: Dummy for firms that switch from below to above the maximum initial q		
	(1)	(2)	(3)
ln(Age)	–0.308***		
	(0.048)		
Old dummy		–0.334***	–0.325***
		(0.045)	(0.045)
Old dummy × R&D			–0.052
			(0.057)
ROA	0.011***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)
Capex	0.074	0.074	0.077
	(0.117)	(0.117)	(0.117)
R&D	0.047***	0.046***	0.050***
	(0.017)	(0.017)	(0.019)
Focus	–0.295***	–0.292***	–0.289***
	(0.105)	(0.105)	(0.105)
KZ-index	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)
Leverage	–2.296***	–2.306***	–2.306***
	(0.147)	(0.147)	(0.147)
Size	0.007	0.008	0.008
	(0.014)	(0.014)	(0.014)
Volatility	3.801***	3.873***	3.887***
	(0.436)	(0.433)	(0.432)
Industry-year FE	Included	Included	Included
Observations	26'475	26'475	26'475
Adjusted R2	0.033	0.034	0.034

Table V

Firm Aging and Product Market Competition

The table investigates how the relation between company age and Tobin's q is affected by industry competition. We use concentration data from Hoberg and Phillips (2011) and, alternatively, industry-specific reductions in import tariffs from Frésard and Valta (2012). *High competition dummy* means concentration below the sample median concentration in any given year. *Lower tariff dummy* identifies industry-years after a reduction in import tariffs. Industries with no significant changes in import tariffs are omitted from regressions 3 and 4. The sample excludes firms younger than 5 in terms of listing age. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1986 – 2008 in regressions 1 and 2 and 1978 – 2009 in regressions 3 and 4.

	Tobin's q (1)	Standardized q (2)	Tobin's q (3)	Standardized q (4)
ln(Age)	–0.160***	–0.140***	–0.328***	–0.323***
	(0.034)	(0.021)	(0.054)	(0.042)
High competition dummy (lagged)	–0.280**	–0.265***		
	(0.116)	(0.072)		
ln(Age)×High competition dummy (lagged)	0.068*	0.047*		
	(0.038)	(0.024)		
Lower tariff dummy			–0.710***	–1.014***
			(0.178)	(0.133)
ln(Age)×Lower tariff dummy			0.254***	0.256***
			(0.060)	(0.044)
Average q		–0.140***		–0.095***
		(0.020)		(0.024)
ROA	–0.006***	–0.005***	–0.009***	–0.006***
	(0.002)	(0.001)	(0.002)	(0.001)
Capex	0.314***	0.137***	0.337	0.352**
	(0.100)	(0.049)	(0.229)	(0.166)
R&D	0.101***	0.106***	0.121***	0.108***
	(0.022)	(0.013)	(0.027)	(0.018)
Focus	0.490***	0.341***	0.347***	0.263***
	(0.062)	(0.037)	(0.082)	(0.056)
KZ-index	–0.006***	–0.004***	0.001	0.000
	(0.002)	(0.001)	(0.003)	(0.002)
Leverage	–2.682***	–1.780***	–3.036***	–2.200***
	(0.083)	(0.049)	(0.127)	(0.094)
Size	0.202***	0.115***	0.234***	0.142***
	(0.010)	(0.006)	(0.014)	(0.009)
Volatility	3.298***	1.581***	5.489***	2.966***
	(0.302)	(0.152)	(0.478)	(0.292)
Constant	0.746***	–0.244**	0.941***	0.268*
	(0.150)	(0.101)	(0.212)	(0.157)
Industry-year fixed-effects	Included	Excluded	Included	Excluded
Number of observations	27'423	27'423	16'586	16'586
Adjusted R2	0.298	0.229	0.340	0.249

Table VI

Firm Aging and Competition in the Market for Corporate Control

The table investigates how the existence of business combination laws in the state of incorporation affects the relation between listing age and Tobin's q. The states passed these laws during the sample period. Regressions 1 to 4 are estimated for the full sample of firms with listing age > 4. Regressions 5 and 6 exclude firms incorporated in Delaware. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Dependent variable: Tobin's q			
	Full Sample		Sample w/o Delaware companies	
	(1)	(2)	(3)	(4)
ln(Age)	–0.333***		–0.360***	
	(0.025)		(0.039)	
Old dummy		–0.283***		–0.244***
		(0.028)		(0.038)
BC dummy	–0.607***	–0.135***	–0.518***	–0.094
	(0.093)	(0.043)	(0.148)	(0.062)
ln(Age) × BC dummy	0.209***		0.178***	
	(0.029)		(0.046)	
Old dummy × BC dummy		0.184***		0.109**
		(0.036)		(0.055)
ROA	–0.004***	–0.004***	0.003	0.003
	(0.001)	(0.001)	(0.002)	(0.002)
Capex	0.346***	0.360***	0.334*	0.354**
	(0.083)	(0.083)	(0.178)	(0.177)
R&D	0.124***	0.125***	0.215***	0.219***
	(0.023)	(0.023)	(0.050)	(0.051)
Focus	0.378***	0.417***	0.332***	0.388***
	(0.043)	(0.043)	(0.068)	(0.069)
KZ-index	–0.004*	–0.004*	–0.004	–0.003
	(0.002)	(0.002)	(0.003)	(0.003)
Leverage	–2.461***	–2.462***	–2.150***	–2.162***
	(0.064)	(0.065)	(0.107)	(0.108)
Size	0.175***	0.165***	0.184***	0.169***
	(0.007)	(0.007)	(0.012)	(0.012)
Volatility	4.488***	4.606***	4.932***	5.149***
	(0.239)	(0.238)	(0.400)	(0.395)
Constant	1.201***	0.446***	1.029***	0.168
	(0.103)	(0.081)	(0.158)	(0.122)
Industry-year FE	Included	Included	Included	Included
Number of observations	56,332	56,332	21,632	21,632
Adjusted R2	0.316	0.314	0.305	0.300

Table VII

Firm Aging and Labor Market Competition

The table investigates the impact of state employment laws on the relation between company age and Tobin's q. The proxy for the enforcement of noncompetition agreements at the state level is the noncompetition enforcement index from Garmaise (2011), which is based on the data provided by Malsberger (2004). The index aggregates the answers to 12 questions about the enforcement of specific dimensions of noncompetition law in the state where the firm is headquartered. The data start in 1992. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1992 – 2009.

	Dependent variable: Tobin's q	
Old dummy	–0.114***	0.034
	(0.026)	(0.052)
Noncompetition index	0.003	0.021**
	(0.007)	(0.009)
Old dummy × Noncompetition index		–0.039***
		(0.011)
ROA	–0.006***	–0.006***
	(0.001)	(0.001)
Capex	0.339***	0.340***
	(0.093)	(0.093)
R&D	0.108***	0.108***
	(0.022)	(0.022)
Focus	0.495***	0.496***
	(0.053)	(0.053)
KZ-index	–0.004**	–0.004**
	(0.002)	(0.002)
Leverage	–2.800***	–2.807***
	(0.074)	(0.075)
Size	0.192***	0.193***
	(0.008)	(0.008)
Volatility	4.266***	4.261***
	(0.260)	(0.260)
Constant	0.265***	0.195**
	(0.096)	(0.099)
Industry-year FE	Included	Included
Number of observations	39,814	39,814
Adjusted R2	0.297	0.298

Table VIII

Firm Age and the Focus on the Core

The table investigates whether firms are more likely to focus on core activities as they get older. It reports coefficients are from conditional logit regressions with industry-year fixed-effects and clustered standard errors. Panel A looks at the likelihood of asset sales. Asset sale data are from SDC Platinum. In regression 1, the dependent variable is a binary variable that identifies firms that engage in an asset sale (*Asset sale dummy*). Regression 2 identifies firms that sell core assets (*Core asset sale dummy*). Such a sale is assumed if the target and the acquiring company have the same 3-digit SIC codes. Regression 3 focuses on sales of non-core assets (*Non-core asset sale dummy*). Such a sale is assumed if the target and the acquiring company have different 3-digit SIC codes. Finally, regression 4 replicates regression 3 for the subsample of firms that actually engage in asset sales (*Asset sale dummy* = 1). Panel B investigates whether old firms are more likely to reduce the number of reported segments on Compustat. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

Panel A: Firm age and asset sales

	Asset Sale Dummy (1)	Core Asset Sale Dummy (2)	Non-core Asset Sale Dummy (3)	Non-core Asset Sale Dummy conditional on Asset Sale Dummy = 1 (4)
Old dummy	0.318***	0.113**	0.435***	0.318***
	(0.038)	(0.050)	(0.049)	(0.071)
ROA	–0.012***	–0.010***	–0.014***	–0.007***
	(0.001)	(0.002)	(0.001)	(0.003)
Capex	–0.208	0.294	–0.958***	–1.161***
	(0.207)	(0.266)	(0.220)	(0.253)
R&D	–0.108***	–0.117***	–0.113**	0.012
	(0.040)	(0.033)	(0.050)	(0.052)
Focus	–1.550***	–0.472***	–2.022***	–1.795***
	(0.078)	(0.098)	(0.082)	(0.119)
KZ-index	0.002	0.001	0.000	–0.007
	(0.002)	(0.003)	(0.004)	(0.008)
Leverage	1.042***	1.104***	0.940***	–0.030
	(0.096)	(0.122)	(0.104)	(0.173)
Size	0.416***	0.405***	0.434***	0.078***
	(0.013)	(0.016)	(0.016)	(0.023)
Volatility	–0.437	1.291***	–1.556***	–3.046***
	(0.272)	(0.375)	(0.335)	(0.616)
MTB-equity	–0.007	0.001	–0.010	–0.013
	(0.005)	(0.007)	(0.007)	(0.011)
Year FE	Included	Included	Included	Included
N	60,515	60,515	60,515	5,783
Pseudo R2	0.153	0.084	0.189	0.085

Panel B: Reduction in the number of segments reported on Compustat

	Reduction in reported segments dummy	
ln(Age)	0.454***	
	(0.041)	
Old dummy		0.410***
		(0.046)
ROA	–0.010***	–0.011***
	(0.002)	(0.002)
Tobin's q	–0.056***	–0.068***
	(0.022)	(0.022)
Capex	–0.373*	–0.413*
	(0.219)	(0.218)
R&D	–0.433**	–0.460**
	(0.188)	(0.205)
KZ-index	0.007**	0.006**
	(0.003)	(0.003)
Leverage	1.152***	1.147***
	(0.133)	(0.133)
Size	0.114***	0.149***
	(0.014)	(0.013)
Volatility	2.372***	1.991***
	(0.501)	(0.505)
Industry-year FE	Included	Included
N	35,371	35,371
Adjusted R2	0.038	0.034

Table IX

Firm Age and Uncertainty about Business Models

The table asks whether investors' uncertainty declines as firms get older. We study the relation between firm age and asset volatility with OLS regressions with industry-year fixed-effects and firm-clustered standard errors. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Dependent variable: Asset volatility	
ln(Age)	–0.048***	
	(0.005)	
Old dummy		–0.049***
		(0.006)
ROA	–0.002***	–0.001***
	(0.000)	(0.000)
Analyst uncertainty	0.224***	0.225***
	(0.039)	(0.039)
Capex	–0.014	–0.011
	(0.017)	(0.018)
R&D	0.003	0.003
	(0.003)	(0.003)
Focus	0.030***	0.046***
	(0.011)	(0.011)
KZ-index	0.000	0.000
	(0.000)	(0.000)
Size	–0.034***	–0.038***
	(0.002)	(0.002)
MTB-equity	0.004***	0.004***
	(0.001)	(0.001)
Constant	0.774***	0.680***
	(0.020)	(0.019)
Industry-year FE	Included	Included
Observations	13,513	13,513
Adjusted R2	0.602	0.597

Table X

Firm Age and Technical Efficiency

The table studies the relation between firm age and technical efficiency. We estimate OLS regressions with industry-year fixed effects and firm-clustered standard errors. In regression 1, the dependent variable is *Sales/Asset*. Regression 2 standardizes sales with the value of the assets in place (V_{AIP}) instead of book assets.
Following Richardson (2006), V_{AIP} is: $V_{AIP} = (1\text{-}ar)BV + a(1+r)X\text{-}ard$. *BV* is the book value of common equity (ceq), *X* is earnings (oiadp), *d* is dividends (dvc), *r* is the discount rate (12%), and *a* is *w/(1+r-w)*. *w* is a fixed persistence parameter with a value of 0.62, as reported in Scharfstein and Stein (2000). Finally, regression 3 looks at the firm's COGS per employee (*COGS/Employee*). Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Sales/Assets (1)	Sales/ VAIP (2)	COGS/Employee (3)
ln(Age)	0.047***	0.172***	–13.128***
	(0.012)	(0.057)	(3.255)
Capex	–0.116***	–0.366***	–48.720***
	(0.023)	(0.118)	(11.174)
R&D	–0.018***	–0.062***	17.013***
	(0.004)	(0.017)	(1.985)
Focus	0.008	–0.093	30.323***
	(0.029)	(0.132)	(7.091)
KZ-index	–0.001	0.011***	–1.629***
	(0.001)	(0.003)	(0.296)
Leverage	–0.370***	3.140***	26.806***
	(0.037)	(0.230)	(10.202)
MTB-equity	0.010***	0.052***	–1.332***
	(0.001)	(0.011)	(0.345)
Size	–0.095***	–0.229***	11.488***
	(0.005)	(0.019)	(1.182)
Volatility	0.993***	–1.691**	166.406***
	(0.133)	(0.704)	(35.474)
ROA	0.016***	0.020***	–0.465***
	(0.000)	(0.002)	(0.092)
Constant	1.563***	2.923***	107.112***
	(0.058)	(0.282)	(15.001)
Industry-year FE	Included	Included	Included
Number of observations	68,609	67,861	67,138
Adjusted/Pseudo R2	0.530	0.082	0.359

Table XI

Firm Age and Investment Activities

The table studies firms' investment policy. It shows the results of OLS regressions with industry-year fixed-effects and firm-clustered standard errors. We consider capital expenses (regressions 1 and 2) and R&D expenses (regressions 3 and 4). All investment measures are standardized with sales. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Capex		R&D	
	(1)	(2)	(3)	(4)
ln(Age)	–0.011***		–0.067***	
	(0.002)		(0.011)	
Old dummy		–0.009***		–0.087***
		(0.002)		(0.013)
Capex			0.014	0.015
			(0.125)	(0.125)
R&D	0.000	0.000		
	(0.003)	(0.003)		
Focus	0.009***	0.012***	0.121***	0.126***
	(0.003)	(0.003)	(0.022)	(0.021)
KZ-index	0.000***	0.000***	0.003**	0.003**
	(0.000)	(0.000)	(0.001)	(0.001)
Leverage	–0.003	–0.003	–0.413***	–0.413***
	(0.007)	(0.007)	(0.037)	(0.037)
Size	0.005***	0.005***	0.045***	0.043***
	(0.001)	(0.001)	(0.004)	(0.004)
Volatility	–0.083***	–0.074***	0.214	0.213
	(0.020)	(0.020)	(0.150)	(0.149)
ROA	0.000**	0.000**	–0.020***	–0.020***
	(0.000)	(0.000)	(0.001)	(0.001)
MTB-equity	0.001***	0.001***	0.009***	0.009***
	(0.000)	(0.000)	(0.003)	(0.003)
Constant	0.026***	0.000	0.225***	0.095**
	(0.007)	(0.006)	(0.051)	(0.041)
Ind-year FE	Included	Included	Included	Included
N	68,609	68,609	68,609	68,609
Adjusted R2	0.184	0.183	0.293	0.294

Table XII

Firm Age and Credit Constraints

The table asks whether the negative relation between firm age and Tobin's q is the result of looser credit constraints in older firms. We test whether the age effect is different for dividend payers and non-payers. Panel A looks at actual dividend payments, Panel B studies total payouts (dividends plus share repurchases). In each panel, the first row shows the coefficients from our standard regression when we add a binary variable for contemporaneous payouts. In the second regression, we measure financial constraints at the time firms enter our sample. Therefore, the binary variable equals 1 if the firm paid dividends (repurchased shares) at age 5. Otherwise, the variable is equal to 0. Finally, the third and fourth regressions in both panels split the sample into payers and non-payers at age 5. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

Panel A: Dividend payments

	Dependent variable: Tobin's q			
	Full sample		No dividends at age 5	Dividends at age 5
	(1)	(2)	(3)	(4)
Old dummy	–0.123***	–0.113***	–0.092***	–0.068***
	(0.024)	(0.027)	(0.029)	(0.020)
Dividend dummy	–0.028			
	(0.026)			
Old dummy × Dividend dummy	–0.045			
	(0.031)			
Dividend 5 dummy		–0.102***		
		(0.027)		
Old dummy × Dividend 5 dummy		–0.018		
		(0.034)		
Additional controls	Included	Included	Included	Included
Industry-year FE	Included	Included	Included	Included
Number of observations	68'609	55'788	35'833	19'955
Adjusted R2	0.318	0.317	0.293	0.485

Panel B: Total payout

	Dependent variable: Tobin's q			
	Full sample		No payouts at age 5	Payouts at age 5
	(1)	(2)	(3)	(4)
Old dummy	-0.110***	-0.095***	-0.076**	-0.082**
	(0.033)	(0.033)	(0.037)	(0.034)
Payout dummy	-0.120***			
	(0.026)			
Old dummy × Payout dummy	-0.036			
	(0.036)			
Payout 5 dummy		-0.046		
		(0.033)		
Old dummy × Payout 5 dummy		-0.009		
		(0.044)		
Additional controls	Included	Included	Included	Included
Industry-year FE	Included	Included	Included	Included

Number of observations	48,110	32,765	21,546	11,219
Adjusted R2	0.302	0.282	0.281	0.244

Table XIII

Company Age and Managerial Entrenchment

The table tests whether the existence of managerial agency problems in older firms can explain the aging effect documented above. The proxies for management entrenchment we consider are *Board size*, *Executive ownership*, the *GIM index* (Gompers, Ishii, and Metrick, 2003), the delay index (*Delay index*) suggested by Kadyrzhanova and Rhodes-Kropf (2011), as well as the alternative takeover protection index (*AT index*) suggested by Cremers and Nair (2005). Panel A shows mean comparison tests between old and young firms. Panel B extends the standard regression from Table II with the proxies for management entrenchment. To preserve space, we report only a subset of the regression coefficients. Since entrenchment index data are available mostly for large and mature firms, the median listing age for that subsample of firms is 21 (compared to 13 in the full sample). Therefore, the new binary age variable is defined as follows: *Age >21 dummy* = 1 if listing age > 21, otherwise *Age >21 dummy* = 0. Moreover, since the number of firm years in that subsample is 3,631 firm-years spread across 1,072 industry-year combinations, we use separate industry and year fixed effects, as opposed to industry-year fixed effects. Panel C performs similar regressions with the addition of interaction terms of corporate governance indices and company age. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1996 – 2009.

Panel A: Mean comparison tests

	Age >21 dummy = 0	Age >21 dummy = 1	t-Test
Board size	7.701	9.313	31.262***
Executive ownership	0.054	0.036	–14.452***
GIM index	7.889	9.352	30.876***
Delay index	5.651	7.343	39.789***
Alternative takeover index	2.053	1.954	6.354***

Panel B: Firm age and the impact of governance

	Dependent variable: Tobin's q	
ln(Age)	–0.104**	
	(0.051)	
Age > 21 dummy		–0.171***
		(0.061)
Analyst uncertainty	1.946***	1.971***
	(0.454)	(0.453)
GIM-index	0.008	0.009
	(0.012)	(0.012)
Boardsize	–0.068***	–0.067***
	(0.014)	(0.014)
Executive stock ownership	0.371	0.350
	(0.561)	(0.555)
CEO age	–0.001	–0.001
	(0.004)	(0.004)
CEO tenure	0.000	–0.000
	(0.004)	(0.004)
Director age	–0.010	–0.009
	(0.008)	(0.008)
Director tenure	0.017**	0.016**
	(0.008)	(0.008)
Other controls	Included	Included
Industry FE	Included	Included
Year FE	Included	Included
Number of observations	3,631	3,631
Adjusted R2	0.601	0.602

Panel C: Interaction of firm age and governance indices

	Dependent variable: Tobin's q					
Age >21 dummy	–0.216***	–0.107	–0.216***	–0.313**	–0.214***	–0.399**
	(0.064)	(0.231)	(0.060)	(0.123)	(0.059)	(0.159)
GIM index	0.001	0.007				
	(0.012)	(0.020)				
Age >21 dummy × GIM index		–0.012				
		(0.024)				
Delay index			–0.020	–0.041		
			(0.023)	(0.036)		
Age >21 dummy × Delay index				0.042		
				(0.044)		
AT index					–0.030	–0.073
					(0.035)	(0.057)
Age >21 dummy × AT index						0.088
						(0.068)
Other controls	Included	Included	Included	Included	Included	Included
Industry-year FE	Included	Included	Included	Included	Included	Included

Table XIV

Firm Age, CEO pay, Cash Payouts, and Cash Holdings

The table asks whether old firms engage in excessive CEO compensation and whether they are more likely to return their cash to shareholders. In Panel A, we use the Model of Core, Guay, and Larcker (2008) to see whether CEO pay is related to firm age. We estimate OLS regressions with industry-year fixed effects and firm-clustered standard errors. The dependent variable is the log of the CEO's total compensation (ln(*CEO total pay*)). Regression 1 replicates the model of Core, Guay, and Larcker (2008). Regressions 2 and 3 add the two measures of firm age as additional controls. Panel B examines payout policies and cash holdings. In regressions 1 and 2, the dependent variable is the firm's dividend payout ratio (*Payout*). Regressions 3 and 4 look at total payout (dividends plus share repurchases). Regressions 5 and 6 study cash holdings. All regressions are OLS with industry-year fixed effects and firm-clustered standard errors. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

Panel A: Firm age and CEO pay

		ln(CEO total pay)	
	(1)	(2)	(3)
ln(Age)		–0.026*	
		(0.014)	
Old dummy			–0.058***
			(0.018)
ln(CEO tenure)	–0.031***	–0.031***	–0.030***
	(0.009)	(0.009)	(0.009)
sp500 dummy	0.126***	0.132***	0.133***
	(0.026)	(0.026)	(0.026)
Tobin's q_{t-1}	0.056***	0.055***	0.054***
	(0.009)	(0.009)	(0.009)
Stock return	0.134***	0.134***	0.133***
	(0.017)	(0.017)	(0.017)
Stock $return_{t-1}$	0.116***	0.117***	0.117***
	(0.017)	(0.017)	(0.017)
ROA	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
ROA_{t-1}	–0.006***	–0.006***	–0.006***
	(0.001)	(0.001)	(0.001)
ln(CEO total $pay)_{t-1}$	0.486***	0.485***	0.484***
	(0.018)	(0.018)	(0.018)
$ln(Sales)_{t-1}$	0.206***	0.210***	0.211***
	(0.012)	(0.013)	(0.012)
Constant	2.512***	2.563***	2.529***
	(0.104)	(0.106)	(0.103)
Industry-year FE	Included	Included	Included
Number of observations	11'786	11'786	11'786
Adjusted R2	0.570	0.570	0.570

Panel B: Firm age and cash payouts

	Payout		Total Payout		Cash Holdings	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Age)	0.019***		0.017***		–0.022***	
	(0.002)		(0.004)		(0.002)	
Old dummy		0.014***		0.013***		–0.018***
		(0.002)		(0.004)		(0.002)
ROA	–0.000	–0.000	0.001***	0.001***	–0.001***	–0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capex	–0.026***	–0.027***	–0.049***	–0.050***	0.014**	0.016**
	(0.006)	(0.006)	(0.011)	(0.011)	(0.007)	(0.007)
R&D	0.002***	0.002***	0.002*	0.002	0.028***	0.028***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Focus	–0.018***	–0.023***	–0.021**	–0.025***	0.055***	0.060***
	(0.004)	(0.004)	(0.009)	(0.009)	(0.005)	(0.005)
KZ-index	–0.005***	–0.005***	–0.005***	–0.005***	–0.003***	–0.003***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Leverage	–0.022***	–0.022***	–0.065***	–0.065***	–0.317***	–0.317***
	(0.005)	(0.005)	(0.011)	(0.011)	(0.007)	(0.007)
Size	0.005***	0.006***	0.015***	0.015***	0.001	–0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Volatility	–0.412***	–0.431***	–0.792***	–0.808***	0.194***	0.213***
	(0.022)	(0.022)	(0.045)	(0.044)	(0.027)	(0.027)
MTB-equity	0.000	0.000	0.001**	0.001**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.056***	0.102***	0.137***	0.178***	0.190***	0.137***
	(0.009)	(0.007)	(0.019)	(0.016)	(0.011)	(0.010)
Industry-year FE	Included	Included	Included	Included	Included	Included
Observations	68'607	68'607	55'673	55'673	68'609	68'609
Adj./Pseudo R2	0.247	0.244	0.100	0.099	0.434	0.432

Table XV

Company Age and Management Age

The table investigates the relation between company age and the age of management and directors. The measures of management and director age are *CEO age*, *CEO tenure*, *Director age*, and *Director tenure*, respectively. Variable definitions are in the Appendix. The symbols ***, **, and * indicate statistical significance in two-sided tests with confidence 0.99, 0.95, and 0.90, respectively. The sample period is 1978 – 2009.

	Old dummy = 0	Old dummy = 1	t-Test
CEO age	61.136	64.516	22.244***
CEO tenure	8.391	8.738	2.620***
Director age	57.794	60.219	27.402***
Director tenure	8.262	10.541	26.182***