Lifetime Earnings

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Abstract:

Using realized earnings over long periods of time, we investigate errors in earnings expectations implied by stock prices of firms. We compute lifetime earnings for 10,129 domestic initial public offerings (IPOs) of equity for the years 1975-2019 and compare such earnings to the IPO offer price or stock price prevailing at the end of every year. Of the 10,129 IPOs, 2,267 survived till 2019, 4,687 merged with other firms and 3,175 were delisted for other reasons. On average, lifetime earnings for a firm is roughly equal to its IPO price. However, that average masks significant variation and skewness. Only 8% (32%) of stocks report enough lifetime earnings, excluding (including) a terminal/merger value, to recover their IPO offer price. Mergers account for most of such success. Surprisingly, even for merged firms, only half pay back the IPO investor in lifetime earnings inclusive of merger consideration. Focusing on the sample of firms that were listed before 2006 and survived till 2019, 40% pay back their IPO investment in earnings and take an average of 11 years to do so. The remaining 60% are unable to pay back their investment despite staying listed for an average of 23 years. The average (median) ratio of lifetime earnings per share, including terminal value, to lifetime stock market wealth created per share is 0.61 (0.47). Thus, stock price-based wealth creation significantly overstates the underlying earnings-based value added. Ranks of firms based on stock price wealth creation differ significantly from those based on lifetime earnings.

Keywords: lifetime, earnings, stock returns, wealth creation, mergers, IPOs

JEL: G11, G23

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Lifetime Earnings

1.0 Introduction

The popular press and the academic literature have long recognized publicly traded stocks as the engine of wealth creation for individual investors and pension funds. However, stock markets go through times when valuations seem stretched and untethered from fundamentals. Hence, it is instructive to assess whether the valuations ascribed by the stock market to individual stocks are corroborated by the actual value created based on fundamental operating data.

A fundamentals-based value of a firm at time *t* is the cash flows/profits it is expected to generate discounted back to time *t* using a risk adjusted discount factor. Expectations, by definition, are subjective. The innovation in this paper is the replacement of expected earnings with realized earnings that firms generate over long periods subsequent to time *t.* With the benefit of hindsight (but taking care to avoid any hindsight bias by examining firms that delisted or got taken over), we document the lifetime earnings of a firm subsequent to the IPO (any point *t*) and benchmark that to the IPO price (stock price at *t*). This helps us provide evidence on the expectational error in earnings (i.e., disconnect between earnings expectations and the ultimate realization of earnings) over long periods of time.[1] Given that earnings and cash flow expectations are key to many streams of literature (market efficiency in general, stock market based wealth creation as in Bessembinder (2018), equity duration literature as in Weber (2018), analysts' forecasts work such as LaPorta (1996), Chan, Karceski and Lakonishok (2003) among others) and in practitioner and classroom settings (most obviously in firm valuation using earnings and cash

[1] Over long periods of time, total earnings should approximate total cash flows. This would extend our findings to cash flows.

flow models), our study provides evidence on the miscalibration of earnings expectations and potential ways to correct such miscalibration.

We compile a list of 10,129 domestic initial public offerings (IPOs) of equity from Professor Jay Ritter's website for the years 1975-2019. IPOs are a natural design choice as our interest is in cumulating the lifetime earnings for a firm. We aggregate discounted earnings per share reported by each such IPO over its lifetime and compare that number to the IPO offer price and to the prevailing stock price in subsequent years. The discount rate is assumed to be the 10-year treasury bill rate plus a risk premium of 5%.[2] This discount rate is conservative in that it assumes that an IPO is as risky as the entire market and is hence likely to overstate the discounted value of lifetime earnings. A lifetime earnings to stock price ratio of one at time *t* would suggest that the firm has generated enough discounted earnings over its life (including its terminal value/merger value/delisting return) to justify its market price at time *t*. A number exceeding (less than) one indicates fundamentals-based performance in excess (short) of stock market expectations.

While seemingly simple, the actual execution of the calculations is complex because of the several nuanced methodological design choices that need to be made. The acquisition price paid by the acquirer to the target firm's shareholders, should the IPO firm be taken over, is assumed to be the target firm's terminal value. The liquidating dividend paid to the last set of shareholders is assumed to be the terminal dividend for delisted firms. We compute the lifetime earnings ratio at the per share level and not at the firm level. For firms that survive till 2019 we compute a terminal value as 2019 earnings per share divided by discount rate at time *t*. We allow firms at least 15 years after their IPO to allow adequate time to realize their earnings potential. Hence, we focus

[2] The discount rate varies from a high of 19.71% in 1981 to a low of 5.02% in 2013. Weber (2018) and Dechow et al. (2020) use a fixed discount rate of 12% when calculating the duration of equities.

on surviving IPOs that came to the public markets before 2006 but include all merged and delisted firms. Fifteen years is reasonable because prior work (Chan, Karceski and Lakonishok 2003) shows that abnormal growth in earnings for most firms barely last 10 years, on average.

Consider the case of Amazon.com. If an investor had purchased a share of Amazon at the time of the IPO in 1997, she would have recovered 19 times her investment in discounted future earnings including terminal value. However, terminal value, measured as 2019 earnings capitalized at the discount rate of 10.3% (discount rate in the year of IPO), accounts for 85% of the 19X recovery rate. If the investor had bought the stock in the year after the IPO, she would have recovered 7.1 times her investment in discounted future earnings including terminal value. These are both healthy returns. However, the lifetime earnings (including terminal value) to stock price per share drops to 0.5 had she purchased the stock during the peak of the internet bubble in 2000, consistent with the elevated stock prices at that point in time. All the actual realized earnings from 1999-2019 plus a perpetuity of the 2019 earnings barely accounts for only half of the year 2000 market capitalization of Amazon. Stated differently, buying Amazon's stock on January 1, 2008 would have returned 5.9X the investment via future earnings relative to just 2.4X had the investor purchased the stock a year later, on January 1, 2009.

The average data comprising other stocks is not that much different. Our sample starts with 10,129 IPOs. After excluding new IPOs since 2005, we are left with 8,809 IPOs. The average ratio of lifetime earnings per share, including terminal value that assumes 2019 earnings accrue to perpetuity, to IPO price per share is 1.2. The median ratio is 0.4, which suggests significant right skewness in the distribution of the ratio. The 4,687 IPO firms that eventually merged, on average, returned 1.7 times their IPO price per share in earnings per share. That return is much higher than the average of the payback for the overall sample. As expected, the 3,175 firms that were delisted

by exchanges did not return their initial investment as their average lifetime earnings per share to IPO price per share is -0.1.

Among the firms that do not get acquired, few justify their initial or early valuations in the form of actual future earnings. Acquired firms pay off more than survivors even though their actual life in terms of years is shorter. Thus, a rewarding strategy for most IPO investors is to get acquired by another firm because the purchase price paid by the acquirer is a big part of their lifetime earnings. Out of 10,129 IPOs, only 32% of the ratio of lifetime earnings to IPO price per share is greater than one. An overwhelming 71% of these ratios above one is attributable to merged firms further reinforcing the finding that the best IPO investment, based on fundamentals, an investor can make is in a firm that gets acquired.

We examine the average number of years it takes for their cumulative lifetime earnings to exceed the IPO market capitalization. To do so, we examine cumulative discounted earnings excluding terminal value because the aim of this exercise is to understand payback periods of equity investments in terms. Only 8% of the entire sample of firms generates actual cumulative earnings that exceed their IPO price, and it takes them an average of 9.25 years to do so. Focusing on the sample of firms that were listed before 2006 and survived till 2019, 40% pay back their IPO investment in earnings and take an average of 11 years to do so. The remaining 60% are unable to pay back their investment despite staying listed for an average of 23 years.

For completeness, we calculate equivalent versions of lifetime earnings expressed as residual income. The residual income calculations incorporate the concern that investors should ideally only pay for earnings in excess of that justified by the cost of capital charge on the capital employed by the firm, which is proxied by the book value of net assets of the firm. We find that residual income-based ratios are worse than their earnings equivalents. This suggests that even

though firms that are able to generate significant lifetime earnings to pay for their IPO price, they are unable, on average, to generate earnings in excess of a normal rate of return (assumed as 10%) on their invested capital.

The analysis thus far concentrates on stock price at any given point in time. It is worth asking how lifetime earnings per share compares with the wealth created in the stock market *over its public lifetime* for individual firms. Inspired by Bessembinder (2018), we compute the "wealth" created by each firm that survives till 2018 based on the stock price per share and compare such wealth to the earnings generated over the same period. For firms that survive till 2019, our lifetime earnings number includes a terminal value that assumes that 2019 earnings will perpetuate without growth forever. Unlike Bessembinder (2018), we assess wealth creation per IPO share rather as the aggregate level of market capitalization. The aggregate level approach over-emphasizes firms that were larger at the time of the IPO or IPOs that raised more capital and acquired other firms even if they might not have created any more wealth per share.

Using the modified Bessembinder (2018) approach, Amazon.com ranks number one in terms of stock market wealth created. However, the ratio of lifetime earnings per share to stock market wealth added by Amazon is a mere 7.7%. Netflix ranks sixth in terms of stock market wealth created although the proportion of lifetime earnings to stock market wealth added is a mere 19.9%. After winsorizing the ratio at 1% and 99%, the average (median) ratio of lifetime earnings to stock market value added is 61% (47%). These statistics suggest that, for the average (median) firm, 39% (53%) of the stock market wealth added will be to have generated via earnings growth in the future, if these stock market valuations have to ever pay off in terms of fundamentals.

Chan, Karceski and Lakonishok (2003) find "no persistence in long-term earnings growth beyond chance." Our work builds on Chan et al. (2003) by following the lifetime earnings of a

firm from the beginning of its life post IPO to its eventual fate as a survivor, takeover target or a delisted firm. Bessembinder (2018) documents that the top 90 stocks account for over half of all the wealth creation, measured as stock price appreciation and dividends, over the years 1926-2016. Although our methodology (cumulative realized earnings per share v/s aggregate wealth creation) and investigated time periods (we look at IPOs post 1975) are different, we find that stock price wealth creation significantly overstates the underlying earnings based value added, suggesting a large disconnect between market expectation and actual performance. We find less skewness in lifetime earnings as compared with the returns-based wealth created per Bessembinder (2018). We would like to sidestep the controversy associated with claims that the stock market is exuberant or irrational at the time of valuation. We simply argue that the unfolding of reality is systematically inconsistent with their initial expectations. The analyst or student who forecasts expected cash flows or earnings for an individual firm might want to explicitly account for the historical macro survival rates of firms and the fundamentals-based performance track records documented in this paper.

The remainder of the paper is as follows. Section 2 describes the computation of lifetime earnings per share. Section 3 presents the data and the main analyses. Section 4 compares lifetime wealth added per share with lifetime earnings. Section 5 concludes.

2.0 Background

2.1 Computing lifetime earnings per share

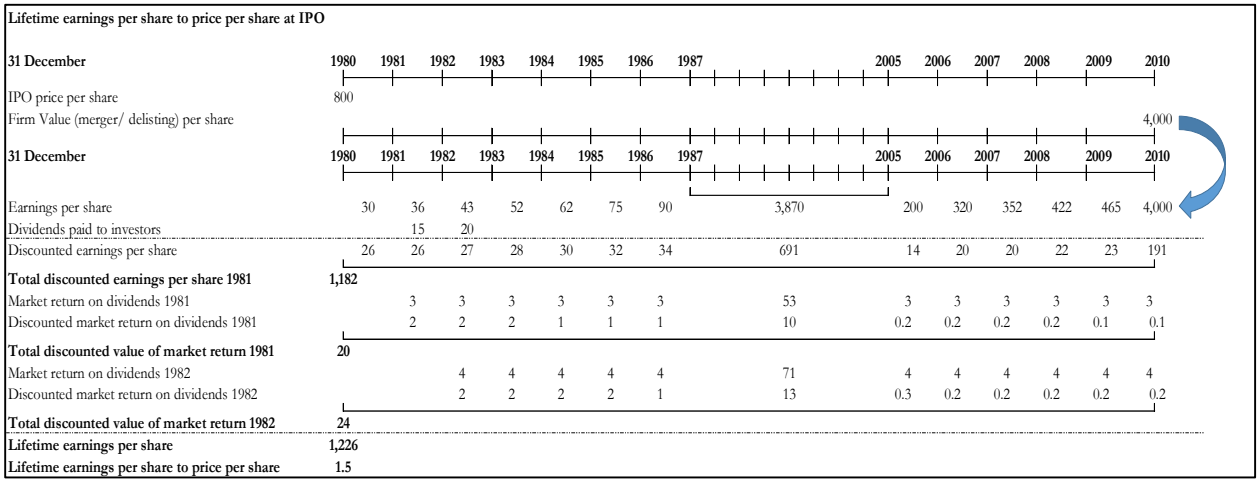
We compute the discounted lifetime earnings per share as the sum of the discounted actual earnings per share in each year plus a perpetuity of the most recent earnings. We discount the earnings using the 10-year treasury bill rate plus 5% assumed to be the average market risk premium. Reliance on the market risk premium assumes that the beta of the firm at the time of

IPO is one. If we were to assume a riskier profile with a higher beta (as is almost certainly the case), we would end up with higher discount rates which, in turn, would lower the discounted lifetime earnings to price ratio. To err on the side of caution, we opt for a lower conservative discount rate. We use the rate as of the last day of the calendar year to discount all the future earnings in order to avoid look-ahead bias in unknown future interest rates. Reliance on a single rate also ensures that the difference between the discounted lifetime earnings and the IPO price is attributable to the gap between expected earnings and actual earnings. The following expression depicts the definition of lifetime earnings per share we use throughout the paper:

$$Lifetime\ earnings\ per\ share_{i,t,T} = \frac{\sum_{n=1}^{T-t} EPS_{i,t+n}}{(1+DiscRat_{t+1})^{n}} + \frac{FVPS_i}{(1+DiscRat_{t+1})^{T-t+1}} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where *i,t* and *T* denote firm, year at the end of which the ratio is computed, and last year of the firm *i* respectively. $EPS_{i,t}$ represents earnings per IPO share of the firm *i* earned in year *t*. Earnings in each period is divided by IPO equivalent shares to compute earnings per IPO share. IPO equivalent shares are computed using stock-split adjustment factor from CRSP. $DiscRate_t$ is the average 10-year treasury bill rate for the year t plus 5%. $FVPS_i$ is (i) acquisition price per share in case of merged firms; (ii) delisting price per share in case of delisted firms; and (iii) an estimated terminal value in case of surviving firms. The terminal value for surviving firms is estimated as the 2019 EPS divided by the discount rate of the year for which the ratio is being computed.

Exhibit 1: Computing ratio of lifetime earnings per share to IPO price for a hypothetical firm



Notes: The timeline below shows how the ratio lifetime earnings per share to IPO price is computed at the time of IPO. The points in time are at the end of each year i.e. 31 December. We obtain earnings per share and dividends paid from COMPUSTAT. We obtain IPO price per share and firm value per share from SDC, Jay Ritter's database and CRSP. Discounted earnings per share is computed using an expected rate of return which is estimated at the 10-year treasury bill rate at the time of IPO plus 5% (equity premium). Market return on dividends is computed using the same expected return on each dividend paid to investors for the years from the time it was paid till the end of the life of the firm. Lifetime earnings per share is sum of total discounted earnings per share, total market return on dividends and discounted value of firm value per share.

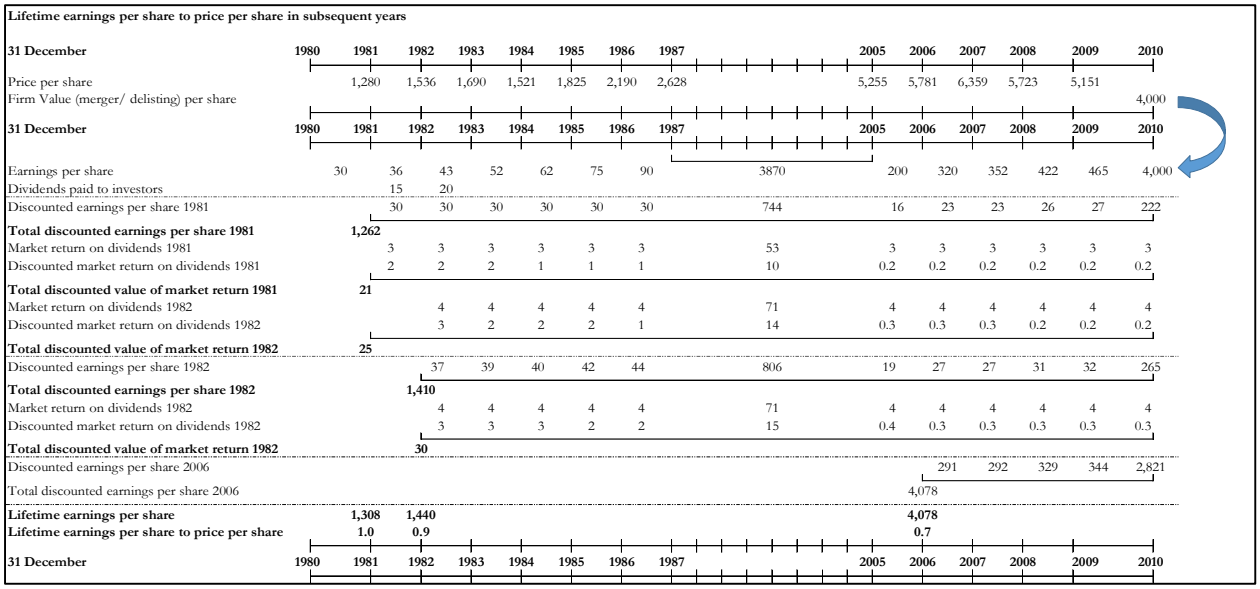
Exhibit 1 above illustrates how we compute the ratio of discounted lifetime earnings per share to stock price per share for each firm at the time of IPO and in subsequent years. We calculate this ratio from the perspective of an investor buying one share at the time of IPO. Consider a hypothetical company that goes public on December 31, 1980 at $800 per share.

Assume that the firm reports earnings per share of $30 and $36 for the years 1980 and 1981 respectively. Assume that the firm was acquired in 2010 for $4,000 a share. That purchase price is the liquidating dividend used to compute discounted lifetime earnings. Alternatively, if the firm is a going concern, $4,000 can be thought of as the terminal value, computed as 2010's earnings expected to be earned into perpetuity at the discount rate prevalent in 1980. Hence, the sum total of discounted earnings per share till year ended 2010 is $1,182 per share.

A practical consideration is the role of dividends. Ignoring dividends will bias our calculation of lifetime earnings because firms that retain earnings can reinvest them to report higher earnings in the future. Following Easton, Harris, and Ohlson (1992), we assume that the investor receiving the dividends reinvests them at the prevailing market rate (treasury + 5%) at the time of the IPO to avoid look-ahead bias with discount rates. In the illustration above, the firm pays dividends of $15 and $20 per share respectively in 1981 and 1982. The present value, at the time of the IPO, of the *return* on those two dividend payments amounts to $20 and $24 respectively. Hence, the lifetime earnings of this firm aggregates to $1,226 ($1182+$20+$24). The ratio of lifetime earnings to IPO stock price in the hypothetical example is 1.5 ($1,226/$800).

Another concern relates to stock splits. The earnings per share number is computed using the number of equivalent IPO shares at the time of IPO. For analytical convenience, we anchor on the stock price at the time of IPO. The actual stock price at the end of subsequent years shown in the timeline is multiplied by the number of shares an investor would have held had she bought one share at the time of IPO. For instance, a split adjustment factor of 64 in the IPO year implies that one IPO share would have converted to 64 shares as at the end of 2019. The stock price used for 2019 is for an equivalent of 64 shares because a share at the time of IPO is equivalent to 64 shares in 2019.

Exhibit 2: Computing ratio of lifetime earnings per share to stock price at the end of every year



The timeline below shows how the ratio of lifetime earnings per share to beginning of year stock price is computed at the end of every year. We obtain earnings per share and dividends paid from COMPUSTAT. We obtain IPO price per share and firm value per share from SDC, Jay Ritter's database and CRSP. Discounted earnings per share is computed using an expected rate of return which is estimated at the 10-year treasury bill rate at the end of respective year plus 5% (equity premium). Market return on dividends is computed using the same expected return on each dividend paid to investors for the years from the time it was paid till the end of the life of the firm. Lifetime earnings per share is sum of total discounted earnings per share, total market return on dividends and discounted value of firm value per share.

Exhibit 2 extends this idea to compute the ratio of the lifetime earnings per share to stock price at the end of every year. At the end of 1981, the stock was trading at $1,280 per share. The discounted lifetime earnings for the years 1981 and beyond work out to $1,308 per share. Hence, the ratio of lifetime discounted earnings to stock price at the end of 1981 is 1.02. Along similar lines, that ratio was 0.9 at the end of 1982. The change in the ratios over time primarily reflects changes in the stock price of the firm. The numerator, discounted lifetime earnings, is far less volatile, by definition, relative to the stock price.

2.2 Computing lifetime earnings per share for Amazon.com

Moving to the realm of the practical, consider the case of Amazon.com, data for which is reported in Table 1. Amazon went public in 1997. Column (2) shows total earnings reported by Amazon till 2019. As can be seen, earnings have not been substantial, except for the last four

years in the sample (2016 - 2019), when Amazon reported income of $2.371 billion, $3.033 billion, $10.073 billion and $11.588 respectively. Column (3) reports the number of IPO equivalent shares, calculated as the number of shares outstanding in millions (shrout in COMPUSTAT/1000) divided by split adjustment factor (cfacshr in COMPUSTAT) multiplied by split adjustment factor on the first day of trading from CRSP. This metric represents the outstanding shares at the end of any year equivalent to number of shares at the time of IPO. The number of IPO equivalent shares has increased by 67% since Amazon went public from 24 million shares to 41 million shares. This increase is primarily driven by seasoned equity offerings as well as employee stock compensation plans. Note that the equivalent outstanding IPO shares number in column (3), by definition, nets out share buybacks. Note also that Amazon's actual number of shares outstanding in 2019 is significantly higher than the 41 million IPO equivalent shares, primarily due to stock splits.

Column 4 provides information on the Earnings per share (EPS), which is column 2 divided by column 3. As we can see on a constant IPO share basis, Amazon reports losses for the first six years before generating modest profits for several years. During its lifetime of 23 years, Amazon earned 73% of its undiscounted earnings in the last two years and 91% in the last four years. The company earned only 9% of its lifetime profits in the first 19 years. Column 5 reports the stock price at the beginning of the year, after adjusting for the discussed split factor. Consistent with the internet bubble of the late nineties, Amazon's stock price rose quickly from a modest $18 at the IPO in 1997 to $914 in 2000 before experiencing a severe decline in the post bubble period. Since then, an IPO equivalent share's stock price has risen to $18,024. Column 6 reports the cost of capital which is the risk-free rate plus a risk premium of 5%. Column 7 reports *LTEPS* or lifetime earnings per share, which is explained in Exhibit 1, except that it does not include estimated terminal value. To illustrate, the $53 LTEPS reported in 1997 represents the present value of all

earnings from 1997 to 2019. Similarly, the $83 shown in 1999 represents the present value of all earnings from 1999 to 2019.

Column 8 provides information on the terminal value per share which is the perpetuity of 2019 earnings discounted using the cost of capital for that year. For example, $289 is a perpetuity of $280 (Amazon's 2019 EPS) calculated using the 1997 cost of capital discounted back to 1997 at the rate of 10.3% (1997 cost of capital). Column 9 provides the sum of lifetime earnings and the terminal value (sum of columns 7 and 8). The next two columns provide the ratio between the columns 7 and 9 and the price at the beginning of each year (column 5). As can been seen from column 10, an IPO investor would have recovered 2.9 times the IPO price-based investment in lifetime earnings. This implies that 22 years of actual earnings generated a return of 190% over the IPO market price. However, an investor who bought the stock on December 31, 1999 at close to the peak of the internet bubble would have barely recovered 0.1 or 10% her investment based on earnings over the next 20 years. In other words, based on actual earnings over 20 years, an investor in 1999 has not recovered most of her investment. That number increases to 0.8 or 80% if the investor had fortuitously timed her purchase on December 31, 2008 after the stock market meltdown following the financial crisis. Ratios of lifetime earnings to stock price subsequent to 2009 range between zero and 0.3.

Skeptics can claim that the above calculations ignore Amazon's future potential. We counter that 20 years is a long time to wait for an investments value to be recovered in actual earnings and cash flows. However, to partially accommodate that criticism, we estimate a terminal value at each point of time assuming that 2019's earnings perpetuate. We deliberately stay away from speculating the expected growth rate in 2019's earnings while calculating such terminal value. A comparison of column 10 with column 11 highlights the overwhelming importance of

terminal value to Amazon (even in the early years with 20 years of future actual earnings). Column 12 quantifies such dependence. Terminal value, consisting of 2019 earnings into perpetuity, accounts for 84.5% of the lifetime earnings at the IPO in 1997. An IPO investor would have recovered 19 times the IPO price-based investment in lifetime earnings including terminal value as compared with only 2.9 times based on earnings over the next 22 years.

For completeness, we calculate equivalent versions of lifetime earnings expressed as residual income. The residual income calculations incorporate the concern that investors should ideally only pay for earnings in excess of that justified by the cost of capital charge on the capital employed by the firm, which is proxied by the book value of net assets of the firm. The last but one column computes lifetime residual income, without terminal value, scaled by stock price whereas the final column includes terminal value. As expected, residual income-based ratios are worse than their earnings equivalents.

Is Amazon an outlier? Is the ratio of Amazon's lifetime earnings (excluding terminal value) per share to share price exceptionally lower or higher than average? It turns out that the average statistics are better but median statistics are closer to those of Amazon, as explained in subsequent sections of the paper.

2.3 Lifetime earnings for 10 largest IPOs with at least 15 years of life (IPOs till 2005)

To consider another example, we identified the 10 largest IPOs between the years 1976-2005. We deliberately ignored IPOs in the last 15 years to allow firms sufficient time to accumulate earnings. This filter, by design, deletes some of the largest IPOs in U.S. history such as Facebook at $16 billion in 2012, Alibaba at $31 billion in 2014 and OneSmart International at $45.5 billion in 2018.

Table 2 lists these IPOs and their lifetime earnings per share scaled by the IPO price per share in the year of IPO and for 10 years after that. In particular, the entry in any year *N,* is lifetime earnings per share from year N onwards divided by the price per share of the firms at the end of the year *N*. The ratio of lifetime earnings, including terminal value, to stock price is above one for all of the first 10 years only for four firms out of 10 firms (Allstate Corp, Alcan Inc., Burlington Resources Inc. and Sprint Corp.). Sprint is an outperformer in the pack even when residual income-based ratios are considered, partly because it was bought out. As seen later, potential overpayment for an acquisition yields large payoffs to the target company's investors.

The ratio of lifetime earnings to stock price and that of lifetime residual income to stock price is below one for Apple only in the first year partly because the interest rate on 10-year treasury bill in 1980, the year of Apple's IPO, was as high as 11.24%. Interest rates started falling in 1982 and beyond. Hence, a subsequent investor in Apple would have consistently reaped between 1.3 to 20 times her investment in future lifetime earnings or residual income, depending on the year and measure considered. On average, these data reinforce the message that stock prices tend to outstrip fundamentals for long periods of time.

3.0 Data and Analyses

3.1 The sample

For the formal analysis, we obtain a list of initial public offerings (IPOs) of equity from Professor Jay Ritter's website for the years 1975-2019. The list is an updated sample of Loughran and Ritter (2004). After removing firms for which PERMNO is not available and American Depository Receipts (ADRs), we arrive at 10,129 IPOs.

The data in panel A of Table 3 shows the 10,129 IPOs came to the equity market between 1975 and 2019. The data are analyzed by year but presented in blocks of five years to facilitate

parsimonious interpretation. Out of the universe of 10,129 IPOs, 3,381 firms survived for at least ten years. Of these, 2,267 firms survived till the end of 2019. The five-year period 1995-1999 is the most productive in terms of number of IPOs as 2,481 firms went public in the technology bubble spanning that window. As documented by Doidge, Karolyi and Stulz (2017), the number of IPOs has dropped precipitously since then. During 2015-2019, only 760 firms had gone public. Firms that went public in 1995-1999 are also less likely to survive their tenth-year anniversary (784 firms of 2,481 or 32%) relative to the 2000-2005 window (307 of 656 firms or 39%) which overlaps with the aftermath of the dot com crash in 2001.

The non-survivors can either get acquired or delisted. Out of 10,129 IPO firms, 4,687 firms merged with other firms eventually and 3,175 firms were delisted for other reasons. Panel B of Table 3 presents the average age of all categories of firms discussed here. Among the firms which merged with other firms, the merger occurs within an average timespan of eight years. An average delisted firm gets delisted within seven years.

3.2 Lifetime earnings per share to IPO price

In Table 4, we report the descriptive statistics of the ratio of an IPO firm's lifetime earnings per share divided by the IPO offer price. The objective is to assess what portion of the market value of the firm is repaid to the investor in terms of earnings. The mean ratio in column 2 for the entire sample is 0.9. Including terminal value raises the mean ratio in column 6 of panel A to 1.1. This suggests that, on average, for the entire sample of IPOs, the aggregate earnings over their lifetime is roughly equal to the expected earnings. Thus, as a portfolio, IPOs seem to have generated value consistent with expectations. However, it must be noted that the discount rate is assumed to be the treasury rate at the time of IPO plus 5% risk premium. Thus, IPOs are being

individually valued at the same risk profile as the overall market. Using a higher discount rate would significantly lower the discounted lifetime earnings to price ratio.

Focusing on the average ratio masks significant variation and skewness, both across firms and across time. Column 4 of panel A suggests that median lifetime earnings to IPO price for all of the 10,129 IPOs in the sample is 0.2. Adding terminal value in column 8 inches the median ratio up to 0.3. The disparity between the mean and the median suggests that a small proportion of firms generate significantly high earnings relative to expectations while most underperform. Un-tabulated data reveals that we need to get to nearly the 67th percentile (71st percentile excluding terminal value) before this ratio gets to one implying that about 67% of firms that went public in the last 45 years have not generated enough earnings over there lifetime to warrant their price at IPO. Further, considering the conservative discount rate used, if we were to raise the cutoff to a ratio of two, we find that only 22% of firms meet this new cutoff.

There is also considerable variation in the ratios, depending on the year in which the firms went IPO. Column 6 of panel A indicates that the average ratio for firms that went public falls systematically as we move from 1975 to 2004. In particular, the average ratios for the select time windows 1975-1979, 1985-1989, 1995-1999 and 2000-2004 are 3.2, 1.5, 1.4 and 0.9 respectively. These patterns are mirrored in the 75th percentile data, the ratios for which in the same time periods are 3.0, 1.7, 1.1 and 1.2. The 123 IPOs that went public between 1975-1979 on average generated earnings that aggregated to 3.2 times their IPO value over 45 years. These numbers drop off significantly for the next generations of IPOs with the LTE of firms that went public in the 1980s and the early 1990s, barely beating the IPO offer price.[3] The 2,481 firms that went public between 1995-1999 have yet to generate enough earnings to justify their IPO valuations with an average

[3] One could argue that this is mechanical as older IPOs have a longer period to generate earnings. While this is true, we also examine fixed twenty year windows from the date a firm goes IPO and find similar results.

ratio of 0.7 (0.8 including terminal value) even though they have been in business for 20 years. These are startling numbers suggesting that the IPOs, on average, take decades to generate enough profits to justify their IPO price and that the payback period varies considerably depending on when the firm goes public.

Next, we partition firms into three groups based on survivorship characteristics. The sample in Table 4 is the average of three types of firms: (i) firms that survive till 2019 (panel B); (ii) firms that got acquired (panel C); and (iii) firms that delisted for other reasons (panel D). One would expect the lifetime earnings of the first group to exceed that of the second and the third. Moreover, we would expect the lifetime earnings of the acquired group of firms to dominate those of firms that delisted.

Column 6 in panel B of Table 4 shows that the average lifetime earnings per share to IPO price of 1.3 for surviving firms is slightly higher than the overall average of 1.2. We further divide these firms into firms which went public before and after 2005. The first group has had the chance to stay in business for at least 15 years. Prior work shows that firms rarely generate high growth rates in earnings and revenue after 10 years (Chan et al. 2003) as reversion in growth rates in revenue and earnings occur within that time horizon. Relying on the 2005 cutoff allows for an additional four years for a firm to realize its growth potential.

Coming back to column 6 in panel B of Table 4, the unconditional average lifetime earnings to IPO price ratio of 1.3 is driven by the firms which have been in existence for more than 15 years. These survivors report an average ratio of 2.4. The number of survivors is small at 2,267 IPOs of a total of 10,129 examined. The number of firms that went public before 2006 and survived until 2019 is much smaller at 947 (less than 10% of our sample). The mean ratio for firms that went public after 2005 is 0.5 whereas the median ratio is negative. One possible explanation is that

many of these firms are still in the process of realizing their full growth potential. Therefore, a skeptic could argue that terminal value is not a good measure of the future earnings potential. However, the findings in Table 3 and Table 4 suggest that many of these firms will not survive and those that do will not generate enough lifetime earnings to justify the price at IPO. Hence the best potential hope for these firms is to get acquired by another firm.

The 4,687 firms that merged, as shown in panel C, on average, returned 1.7 times their IPO price in lifetime earnings. That payback is higher than the average payback for the overall sample. The higher payback is attributable to the discounted acquisition price the investor gets at the time of merger. Remarkably, even the median ratio of 1.0 in column 8 is the best of all groups examined and points to merger as the best way to generate payback for IPO firms. As expected, the 3,175 firms that delisted did not return their initial investment as the median lifetime earnings to IPO price is -0.1 in column 8 of panel D.

Columns 10-17 report data on lifetime residual income-based versions of the ratio. As expected, residual income ratios are worse than those that rely on earnings. Consider the average ratio of lifetime residual income to IPO price in column 16 of panel B. The average (median) ratio is 0.9 (0.3) for surviving firms that went public before 2005. A noteworthy statistic is that the market return on dividends and terminal value account for 100% of the lifetime residual income for such firms.

Histograms plotting the ratio of lifetime earnings and lifetime residual income, including terminal value, to IPO price are presented in Figure 1. We focus on a ratio of one as a natural cutoff, even though one could argue that the cutoff should be higher given our conservative (i.e., lower) discount rate. Of the 10,129 IPOs we study, 3,272 or 32% of IPOs end up with a lifetime earnings to price ratio of more than one. Mergers account for an overwhelming 71% of ratios

above one. If we exclude surviving firms listed after 2005, mergers account for 78% of ratios above one. Further, many of these firms did not have to actually generate earnings to justify their IPO price. In fact, almost 38 percent of firms that were acquired had negative earnings at the time of their acquisition. But all merged firms are not uniformly productive for the IPO investor. Of the firms with a ratio of lifetime earnings to IPO price of less than one, 34% are accounted for by mergers and 44% by delisted firms. More sobering, lifetime earnings per share (including a terminal value) of about 51% of the present firms which have survived at least 15 years is less than their IPO price.

The results in this table have important implications for calibrating our expectations when carrying out valuation exercises and for evaluating the future of the more recent crop of IPOs. The analyst or student who forecasts expected cash flows for an individual firm might want to explicitly account for the historical macro survival rates and performance documented here. In particular, our results suggest that half the IPOs get acquired and many of them are acquired prior to generating meaningful earnings. Around 30% of them go out of business and generate cumulative earnings of almost zero. Finally, about 22% survive and many are unable to generate cumulative earnings to justify their valuation even with significant time (more on this in section 3.5).

3.3 Regression evidence on which IPOs have higher payback ratios

The evidence thus far suggests that IPOs as a portfolio, on average, are fairly priced based on long-term realized earnings though the averages obscure significant cross-sectional and time series variation. In this section, we examine factors that could explain the variation in the lifetime earnings to price ratio. We estimate a logistic regression where the dependent variable is an indicator turned to one when the ratio of lifetime earnings per share to IPO price is greater than or equal to one. Table 5 shows that 34% (27%) of the sample reports lifetime earnings (lifetime

residual income), including terminal value, to IPO offer price ratios in excess of one. Eleven percent of the IPOs survive till 2019 whereas 53% of firms get merged. In Panel A of Table 6, the dependent variable is an indicator variable for whether lifetime earnings, including terminal value, to IPO offer price is greater than one. Panel B examines the dependent variable based on the lifetime residual income (including terminal value). The independent variables are mostly drawn from the IPO underpricing literature and long-run IPO under-performance literature (Loughran and Ritter 2004; Ljungqvist and Wilhelm 2003; Ritter 1991; Ritter and Welch 2002; Baker and Wurgler 2006; Teoh, Welch, and Wong 1998).

Column 1 of Table 6 shows that several variables are correlated with the likelihood that actual long-term earnings are consistent with expected earnings. The coefficient on size is positive and significant suggesting that larger IPOs, as proxied by the IPO proceeds (labeled size) are more likely to realize their potential. One explanation for this is that larger IPOs are more likely to be more mature at the time of their offering. Consistent with this argument, we find that Age before IPO, which measures the years the firm has been in existence prior to the offering, is also positive and highly significant. IPOs that were relative values at the time of the IPO, proxied as sales/enterprise value at IPO, are also more likely to live up to their expectations.

Timing of the IPO is also important in determining its ability to meet long-term earnings. We find that firms that enter public markets during periods when markets are optimistic (proxied by higher Shiller's CAPE ratio for the entire market) are less likely to recover their IPO price in terms of lifetime earnings, consistent also with the descriptive evidence in Table 4 that shows IPOs in period like1994-1999 have low ratios. This is likely due to the high prices at which the offering is brought to the market which, in turn, raises the benchmark for actual earnings realizations. Firms, with lifetime to IPO price ratios of less than one, are more likely to have reported losses in

the year of the IPO. Firms that report negative earnings at the time of IPO are associated with lower payback suggesting that the high valuations ascribed to these firms in the hopes of substantial profits in the future are not quite realized.

Other factors associated with higher lifetime earnings to IPO price ratios include: (i) firms with greater stock returns on the first day of trading (IPO underpricing) and in the first trading year; (ii) firms that have longer post-IPO lives; and (iii) firms that have eventually merged. Firms that belong to the computer industry are more likely to have lower lifetime earnings to IPO price ratios.

Columns 2-4 decompose the results in column 1 into firms that survived (before 2006), the ones that got merged or acquired and the ones that were delisted for other reasons. There are several striking findings across the three columns. First, "value" stocks at the time of offering are more likely to be "winners" from an actual earnings perspective irrespective of their survival outcome. The coefficient on the Sales to enterprise value metric is consistently positive across the three columns. Loss dummy is another interesting variable. Firms that report earnings at the time of IPO are likely to have a harder time meeting the expectation built into their offering price. While this is true across all three groups, the finding is the strongest for firms that survive and do not get merged. This is surprising given that the delisted firms have the shortest time period to meet their earnings expectations. The results on Shiller CAPE differ based on the sample examined. While the coefficient on CAPE in the overall sample is negative, it is positive for the surviving firms' sample. Firms that go public during periods of elevated valuations have difficulty living up to expectations except if they are given a long enough runway. It must be noted that the results in column 2 already benefit from a look-ahead survivor bias suggesting that the positive coefficient on the Shiller CAPE ratio is not entirely unexpected. However, the negative coefficient

on the Age after IPO for the surviving firms is somewhat surprising. This result suggests that the longer these surviving firms stay in business, the less likely they are to meet their earnings expectations factored into their IPO price. First day underpricing and first year return do not explain payback ratios for surviving firms. Columns 5 to 8 repeat the analysis for lifetime residual income to IPO price and end up with approximately the same results partly because the cross-sectional correlation between lifetime earnings to IPO price with that of lifetime residual income to IPO price is 0.97 in panel B of Table

In sum, the results suggest that bigger firms tend to justify the IPO price in terms of their long-term earnings and residual income. More mature IPOs are better than younger IPOs at repaying an IPO investor via lifetime earnings. Firms that survive and get merged are more likely to payback their IPO price relative to firms which get delisted. Firms that report losses in their first year of being public are less likely to earn sufficient profits in their lifetime to justify their IPO price. IPOs in the computers industry are less likely to earn profits during their lifetime in excess of the IPO price. As expected, Schiller's CAPE or positive market sentiment at the time of the IPO is negatively associated with the ratio overall and for merged and delisted firms in particular. These findings have implications for market efficiency, valuation assumptions, and forecasting. They also speak to the long-term implications for IPOs of the last few years which have been characterized by elevated valuations.

3.4 Adjustment for R&D spending

A potential criticism of our approach so far is that we have focused on GAAP lifetime earnings. An important and substantial expense for many firms is R&D expenditure. Many argue that R&D ought to be capitalized and amortized in a manner similar to capital expenditures. To address this issue, we capitalize each year's R&D and amortize cumulative

R&D over five years. The choice of a five-year amortization period is based on prior work in the area (Lev and Sougiannis 1996, Falato, Kadyrzhanova, and Sim 2013 and Enache and Srivastava 2014). Un-tabulated results based on such amortization look very similar to our reported results. The only big change in the lifetime earnings number is driven by the most recent five years of unamortized R&D. The rest of past R&D is captured in earnings with a slight delay.

3.5 Average recovery period

In this section, we examine the average number of years it takes for their cumulative lifetime earnings to exceed the IPO market capitalization. We examine discounted cumulative earnings excluding terminal value because the aim of this exercise is to understand payback periods for investment rather than total lifetime earnings. The results provided in Table 7 are striking. Consider the entire sample of firms. Only 8% of all firms generate actual cumulative earnings that exceed their initial value (837 firms out of 10,129). It takes these firms an average of 9.25 years to recover its IPO valuation in earnings. The remaining firms do not ever generate earnings to justify their IPO price.

Partitioning the sample into the three groups examined in prior table yields additional insights. The results for surviving firms are particularly interesting. Only 19% of surviving firms have a ratio that exceeds one (426 out of 2,267). It takes these firms an average of 10.45 years to payback the initial IPO price. However, the remaining 1,841 firms have not been able to generate enough cumulative earnings to justify their initial IPO valuation even though many of them have been around for over 20 years. Of these 1,841 firms, 565 firms went public before 2006 and survived for around 23 years but could not generate enough earnings to justify their IPO price. That number is higher for older firms. For example, un-tabulated analyses show that, of the 58 surviving firms from the 1980-1984 cohort of IPOs, more than half have yet to pay

back their initial valuation in earnings even though they have been public for over 35 years. The 1995-1999 cohort is also interesting because nearly 70% of these IPOs are yet to reach a ratio in excess of one despite staying listed for over 20 years perhaps because this period was characterized by higher IPO valuations. It is understandable that the more recent IPO cohorts have a ratio less than one as they have not had enough time to generate earnings. But the results have important implications for market pricing and valuation because they should help analysts and students calibrate expectations when valuing stocks.

The results for merged firms are a bit more difficult to interpret. Merger curtails the life of the firm and prevents the natural unfolding of the actual earnings path of a firm. However, there is still a lot to learn. Only 7.5% of firms (348 out of 4,687 firms) are able to reach a ratio exceeding one before they merge and they do so in about eight years. The remaining 92% of firms survive for around six years before they merge. Focusing on cohorts, we observe that mergers appear to occur progressively sooner in their public lifetimes. The earliest cohorts from the 70's and 80's survived for around eight to ten years before being bought out. This time window has progressively declined as the 1990s and 2000s cohort are being bought out within five years.

Finally, the sample of delisted firms confirms the expectation that most of these firms never reach a ratio of one (98%). The average lifespan of these firms before they get delisted is 5.72 years. As with merged firms, delisting appears to occur sooner as early cohorts survive an average of seven years relative to four years for later cohorts. These results shed light on the extent of patience needed on the part of investors to recover their investments in terms of fundamental earnings.

Including terminal/merger value in our calculations increases the number of firms that generate lifetime earnings in excess of expectations and shortens the payback period. However, most of this increase comes from the sample of merged firms. These results are also interesting in light of the findings reported by Weber (2018). Weber (2018) determines equity duration using forecasted cash flows and a terminal value that is the difference between forecasted cash flows and current market value. Based on this approach, he finds that the average duration is over 17 years. Realized earnings data used here, as opposed to market prices, suggests that most firms have payback periods well in excess of 17 years, particularly if they have not benefited from a merger.

3.6 When do the expectational errors correct?

The results thus far point to significant earnings expectation errors in the pricing of equities. The stock prices of many firms embed higher expected earnings as compared with the actual realizations od earnings over long periods of time (i.e., lower *LTEMV* ratio). These expectational errors are related to various factors such as initial valuations, market sentiment and initial profitability. It is natural to ask why these errors are not arbitraged away by informed investors. Consistent with Keynes (1936) and Shleifer and Vishny (1997), we suggest that limits to arbitrage is a contributing factor. We focus on the distribution of the ratios of lifetime earnings to prevailing stock prices (not IPO price) before and after two market corrections: (i) 2000-2002 tech crash; and (ii) the 2008 financial crisis. The results are provided in Table 8. The median ratio of lifetime earnings to stock price at the beginning of 2000 is 0.3 but rises to 0.7 at the beginning of 2007. By the beginning of 2003, the median ratio of lifetime earnings to stock price was 1.6 but had risen to 1.9 at the beginning of 2009. These patterns suggest over-optimism in earnings expectations before each of the market corrections.

4.0 Stock market wealth v/s lifetime earnings

The analysis thus far considers earnings reported by a firm over its lifetime compared to the price an investor paid at the time of the IPO. However, the discussion ignores the extent of wealth the firm has generated through stock returns for the IPO investor over its life. A natural question is the correlation between the wealth created by a firm for a buy-and-hold investor over time for a stock with its discounted lifetime earnings per share. In equilibrium over long periods of time, we would expect lifetime earnings of the firm to closely mirror the wealth creation through stock returns and dividends.

To compute lifetime wealth per share, we broadly follow Bessembinder (2018). Bessembinder (2018) computes aggregate wealth creation by summing the future value of the yearly excess return earned on the beginning market value of the firm. Excess return is defined as stock return over treasury bill rate. Future value is computed using the treasury bill rate as the discount rate. We depart from Bessembinder (2018) in two ways. First, we compute stock wealth created over the lifetime of the firm on a per share basis whereas he computes the lifetime wealth creation for the whole firm. This modification matters because firm A might have created more stock market wealth than firm B but firm B may have added more wealth *per share* relative to firm A. In other words, the whole firm approach followed by Bessembinder (2018) overemphasizes firms that were larger at the IPO or IPOs that raised more capital and acquired other firms even if such larger firms have not created any more wealth per share.[4]

[4] For example, under the aggregate approach, a firm that has a 10% stock return after an all stock acquisition that doubles its market capitalization will report twice the wealth creation in that year compared to a 10% return in the year prior to the acquisition. Under the per-share method the wealth creation to the IPO investor will be the same in both years.

Second, Bessembinder (2018) examines the stock market wealth accumulated for every stock by summing the future value of the wealth created in each year at the end of 2016. However, we have discounted the wealth back to the date of the IPO to be able to compare such wealth addition to the discounted lifetime earnings per share. This is just a matter of scaling and does not affect our results.

To be clear, stock market wealth accretion in this paper is defined as the excess return over the treasury-bill rate every year on one IPO share. Such wealth is computed for each year during the life of the firm and discounted back to the IPO date at the treasury bill rate plus 5%, to be consistent with our computation of the discounted lifetime earnings per share. We rely on the following modified version of Bessembinder's (2018) expression (3):

$$Wealth = PV_{0,T} * W - W_0 = I_0 * \left(R_1 - R_{f1}\right) * PV_{t,1} + I_1 * \left(R_2 - R_{f2}\right) * PV_{t,2} + \cdots +$$

$$I_{T-2} * \left(R_{T-1} - R_{fT-1}\right) * PV_{t,T-1} + I_{T-1} * \left(R_T - R_{fT}\right) * PV_{t,T} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The left-hand side of expression (2) is the difference between the present value of the investor's actual wealth at the end of the life and the wealth at the time of IPO. I_T represents the price per IPO share at the beginning of year T. R_T and R_{fT} represent stock return including dividends and average 10-year treasury bill rate for the year T respectively. Note that $PV_{1,T}$ in (2) above stands for present value factor which brings the wealth created each year to the time of IPO:

$$PV_{t,T} = \frac{1}{\left[\left(1 + R_{ft+1}\right) * \left(1 + R_{ft+2}\right) * \ldots\ldots\ldots * \left(1 + R_{fT-1}\right) * \left(1 + R_{fT}\right)\right]} \ldots\ldots\ldots\ldots\ldots (3)$$

Panel A of Table 9 presents the distribution of the ratio of lifetime earnings to lifetime wealth per share. The number of surviving firms increases whereas average lifetime earnings per share and average lifetime wealth decreases as the year group gets close to 2019. The average ratio of lifetime earnings to lifetime wealth ranges from 31% to 87% except for the year group

1975 to 1979. The range of the ratio falls to between 5% to 55% after we add IPO price to lifetime wealth per share.

Panel B tabulates the list of the top 50 firms that have added the most stock market wealth over their lifetimes per share and the associated with discounted lifetime earnings per share. We tabulate the list only for surviving firms because survivors are associated with the largest stock market wealth increases. Amazon.com ranks number one in terms of stock market wealth per share. The ratio of lifetime earnings per share to stock market wealth added by Amazon is a mere 7.7%, as shown in column 5. The ratios of Microsoft, Home Depot and Cisco Systems range between 30.3% to 39.9%. Netflix ranks sixth in terms of stock market wealth created per share. However, the ratio of lifetime earnings to stock market wealth added is only 19.8%. It is important to recall that the lifetime earnings number includes an estimate for terminal value based on the assumption that 2018 earnings will repeat, with no growth, forever. Hence, in Amazon's case, 92% of the lifetime wealth added will have to be earned via growth in earnings. The same inference holds even for fairly mature firms such as Microsoft, Home Depot and Cisco Systems. That is, at least 60% of the stock market wealth added for these firms will have to be earned via earnings growth in the future. After winsorizing the ratio at 1% and 99%, the average and median of the ratio of lifetime earnings to stock market value added is 61% and 28% respectively

Column 4 computes lifetime wealth, as opposed to lifetime wealth added. That is, we add the IPO price per share to the lifetime wealth created number discussed before. One could plausibly argue that comparing lifetime earnings with lifetime wealth is a better "apples to apples" comparison relative to a comparison based on lifetime wealth added. Having said that, the average ratio of lifetime earnings to lifetime wealth, reported in column 4 for the stocks discussed above barely changes. However, the change makes a big difference to the distribution of the ratio. After

winsorizing the ratio at 1% and 99%, the average and median of the ratio of lifetime earnings to stock market wealth is substantially lower at 33% and 24% respectively. In sum, an examination of fundamentals-based value added can lead to significantly different conclusions relative to relying on stock price-based wealth accretion data alone.

Given that the Bessembinder approach is likely to be sensitive to the point in time at which wealth creation is measured, we extend the analysis to different time periods and examine lifetime wealth per share and lifetime earnings per share pre-crisis and post-crisis periods. We investigate returns-based wealth created and fundamentals-based value added from the date of IPO till the beginning of 2000, 2003, 2007 and 2009. Table 10 presents the average and the median lifetime wealth per share and lifetime earnings per share for the surviving firms. Surviving firms are based on the period examined. For the period till the beginning of 2000, the firms which exist in the beginning of 2000 are considered.

As expected, we observe a decline in the lifetime stock market wealth generated between 2000 and 2003 due to the dot com crash. We also find a decline in the average and median wealth between 2007 and 2009 due to financial crisis. Because fundamentals-based earnings numbers are much less volatile than market returns, we do not observe a sharp decline from 2000 to 2003 and from 2007 to 2009 in lifetime earnings per share. The decline in average lifetime earnings is less than that in average lifetime wealth per share. Interestingly, we do not see similar patterns in median lifetime wealth per share and median lifetime earnings per share.

5.0 Conclusions

In this paper, we ask how the lifetime earnings of a firm compares with the firm's IPO offer price and the stock price at the end of each year. We analyze a list of 10,129 domestic initial public offerings (IPOs) of equity for the years 1975-2019. Out of 10,129 IPO firms, 2,267 firms

survived, 4,687 firms merged with other firms eventually and 3,175 firms were delisted. On average, for the entire sample of IPOs, the aggregate earnings over their lifetime is roughly equal to the IPO price. However, the average ratio masks significant variation and skewness, both across firms and across time. About 67% of firms that went public in the last 45 years have not generated enough earnings over their lifetime to justify their price at IPO. The average ratios of lifetime earnings to IPO offer price for the time windows 1975-1979, 1985-1989, 1995-1999 and 2000-2004 are 3.2, 1.5, 1.4 and 0.9 respectively.

An eventual merger is the best outcome in terms of payback for the IPO investor. Merged firms, on average, returned 1.7 times their IPO price in lifetime earnings and that higher ratio is driven by the acquisition price the investor gets at the time of merger. Delisted firms did not return their initial investment as the average lifetime earnings to IPO price is -0.1. Lifetime earnings per share (including a terminal value) of about 52% of the present firms which have survived at least 15 years is less than their IPO price. Finally, we go on to compare the lifetime stock market wealth generated by firms to their lifetime earnings. The average and median of the ratio of lifetime earnings to stock market wealth is only 33% and 24% respectively.

Our results have implications for analysts and students interested in valuation and forecasting of fundamentals. At the very minimum, they may want to explicit calibrate future expectations of earnings for stocks in general and IPOs, in particular, using the historical data we present in this paper.

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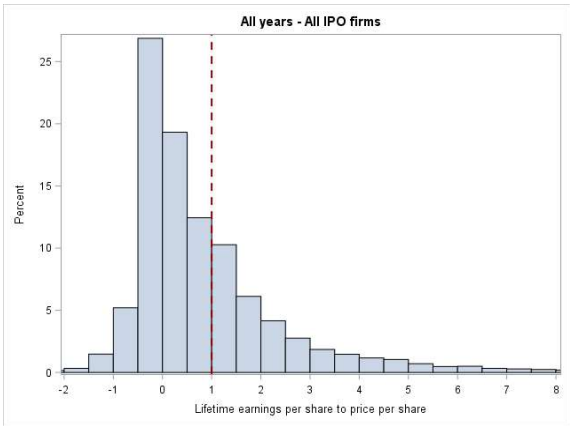
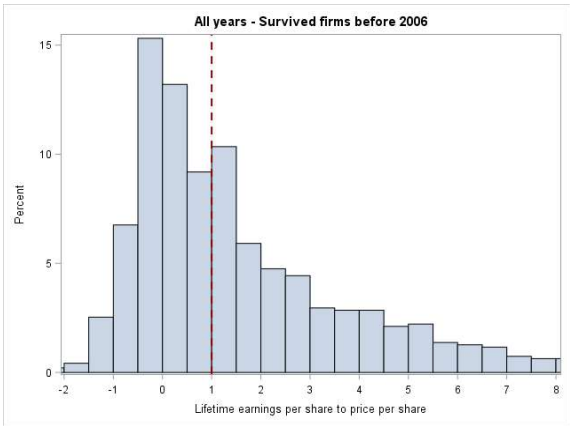
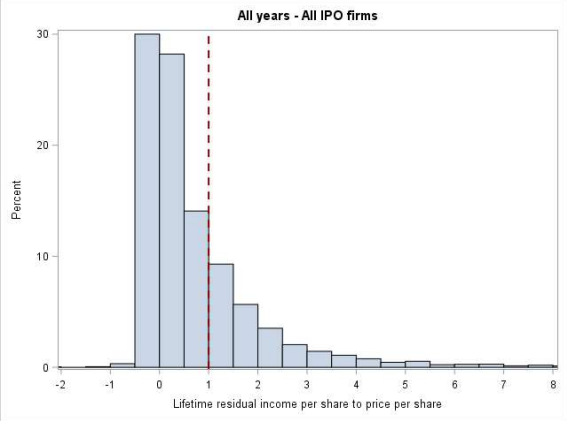
Figure 1: Histogram of the ratio of lifetime earnings and lifetime residual income including terminal value per share to IPO price

Below are the histograms for the ratio of lifetime earnings per share to price per share and lifetime residual income per share to price per share at the time of IPO for all IPO firms and surviving firms. The ratio is computed the same way as explained in the Exhibit 1 including estimated terminal value for the surviving firms. The survived firms include only those firms which have at least 15 years of life. The histograms have bins of 0.5, lower limit of -2 and upper limit of 8. Ratios outside these limits are considered for computing the percentages in the histogram and text.







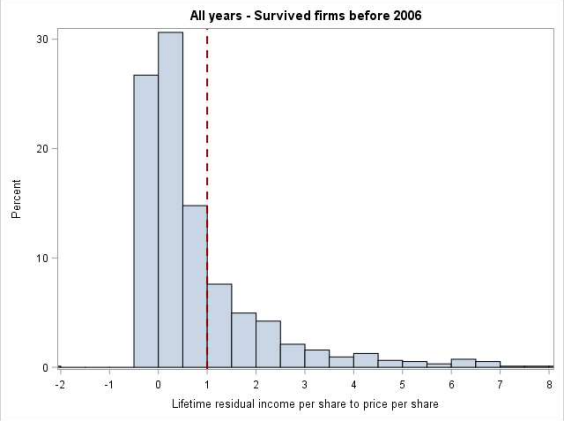


Table 1: Lifetime earnings per share to price per share for Amazon.com

The table below shows the lifetime earnings per share to price per share and lifetime residual income per share to price per share computation for Amazon Inc over its life. We obtain earnings, number of shares outstanding and book value per share from COMPUSTAT. We obtain share price, number of shares outstanding and adjustment factor from CRSP. We obtain IPO price from SDC, Jay Ritter's database and CRSP. *Earnings* is income before extraordinary items available to common shareholders (ibcom) from COMPUSTAT annual dataset. *IPO equivalent shares* is number of shares outstanding in millions (shrout/1000) divided by split adjustment factor (cfacshr) multiplied by split adjustment factor on the first day of trading from CRSP. This represents the number of shares equivalent to number of shares at the time of IPO. *Earnings per share* is earnings divided by IPO equivalent shares which represents earnings belonging to one IPO share over the life of Amazon Inc. *Beginning price* for the first year is IPO price. Beginning price for the years after first year is the price of an IPO share which is computed as CRSP price at the beginning of each year multiplied by split adjustment factor (cfacpr) divided by split adjustment factor on the first day of trading. *COC* is the cost of capital or expected rate of return estimated at 10-year treasury bill rate at the end of each year plus 5% (equity premium). We use this rate for discounting earnings per share, residual income per share and terminal value per share. *LTEPS* is lifetime earnings per share which is explained in Exhibit 1 except that it does not include estimated terminal value. *Term Val* per share is the discounted value of terminal value per IPO share estimated by capitalizing earnings per IPO share at the discount rate (COC). *LTEDTV* per share is lifetime earnings per share including a discounted value of an estimated terminal value per share (*Term Val*) as explained in Exhibit 1. *LTEMP* is the ratio of lifetime earnings per share (excluding terminal value) to price per share (Beginning price). *LTEDTVMP* is the ratio of lifetime earnings per share (including discounted terminal value) to price per share (*Beginning price*). Term Val % is the ratio of estimated terminal value to price per share. *Beginning book value per share* is total shareholders' equity (teq/seq) at the beginning of each year or difference between total assets (at) and total liabilities (lt) at the beginning of each year where total shareholders' equity is not available in COMPUSTAT. *Beginning book value per share* at the time of IPO is computed as book value per share at the end of first year less earnings per share. *Residual income per share* is earnings per IPO share less 10% of beginning book value IPO per share. *Lifetime RI per share, LTRITV per share, LTRIPSMP and LTRITVPSM* is computed the same way as *LTEPS*, *LTEDTV per share*, *LTEMP* and *LTEDTVMP* respectively where we replace earnings per share with residual income per share.

Year	Earnings	IPO equivalent shares	Earnings per share	Beginning price	COC	LTEPS	Term Val per share	LTEDTV per share	LTEMP	LTEDTVMP	Term Val %	Beginning book value per share	Residual income per share	Lifetime RI per share	LTRITV per share	LTRIPSMP	LTRITVPSMP
1997	(28)	24	(1)	18	10.3	53	289	342	**2.9**	**19.0**	84.5	447	(3)	-8	334	**(0.5)**	**15.6**
1998	(125)	26	(5)	60	9.9	67	359	427	**1.1**	**7.1**	84.2	28	(5)	-3	424	**(0.0)**	**5.9**
1999	(720)	28	(25)	643	9.7	83	416	499	**0.1**	**0.8**	83.4	139	(26)	4	503	**0.0**	**0.7**
2000	(1,411)	30	(47)	914	10.9	90	326	416	**0.1**	**0.5**	78.4	266	(48)	17	433	**0.0**	**0.4**
2001	(557)	31	(18)	187	8.8	198	636	834	**1.1**	**4.5**	76.3	-	(18)	93	927	**0.5**	**3.9**
2002	(150)	32	(5)	130	6.7	310	1324	1634	**2.4**	**12.6**	81.0	-	(5)	157	1791	**1.2**	**11.4**
2003	35	34	1	227	6.0	363	1725	2087	**1.6**	**9.2**	82.6	-	1	186	2273	**0.8**	**8.4**
2004	588	34	17	631	6.2	376	1728	2103	**0.6**	**3.3**	82.1	-	17	192	2296	**0.3**	**3.0**
2005	333	35	10	531	8.0	315	1111	1426	**0.6**	**2.7**	77.9	-	10	153	1579	**0.3**	**2.4**
2006	190	35	6	566	9.8	277	773	1050	**0.5**	**1.9**	73.6	246	5	130	1179	**0.2**	**1.6**
2007	476	35	14	474	9.7	302	876	1178	**0.6**	**2.5**	74.4	431	12	139	1317	**0.3**	**2.1**
2008	645	36	18	1,112	6.6	412	1974	2386	**0.4**	**2.1**	82.7	1,197	15	188	2573	**0.2**	**1.9**
2009	902	37	24	615	5.1	477	3182	3659	**0.8**	**5.9**	87.0	2,672	17	215	3874	**0.3**	**5.5**
2010	1,152	38	31	1,614	5.1	476	3325	3801	**0.3**	**2.4**	87.5	5,257	17	208	4009	**0.1**	**2.2**
2011	631	38	17	2,160	5.0	473	3575	4048	**0.2**	**1.9**	88.3	6,864	(1)	204	4251	**0.1**	**1.7**
2012	(39)	38	(1)	2,077	5.1	479	3735	4214	**0.2**	**2.0**	88.6	7,757	(22)	215	4429	**0.1**	**1.9**
2013	274	38	7	3,010	5.0	506	3965	4471	**0.2**	**1.5**	88.7	8,192	(14)	248	4719	**0.1**	**1.4**
2014	(241)	39	(6)	4,785	5.0	524	4164	4688	**0.1**	**1.0**	88.8	9,746	(31)	275	4963	**0.1**	**0.9**
2015	596	39	15	3,724	5.0	557	4373	4930	**0.1**	**1.3**	88.7	10,741	(12)	320	5250	**0.1**	**1.3**
2016	2,371	40	60	8,111	5.2	566	4404	4970	**0.1**	**0.6**	88.6	13,384	26	346	5316	**0.0**	**0.6**
2017	3,033	40	76	8,998	5.8	529	4083	4612	**0.1**	**0.5**	88.5	19,285	28	334	4946	**0.0**	**0.5**
2018	10,073	41	247	14,034	6.8	477	3610	4087	**0.0**	**0.3**	88.3	27,709	179	321	4409	**0.0**	**0.3**
2019	11,588	41	280	18,024	7.1	262	3666	3928	**0.0**	**0.2**	93.3	43,549	175	163	4092	**0.0**	**0.2**

Table 2: Lifetime earnings per share to price of top 10 IPOs

The table below presents the ratio of lifetime earnings per share (including and excluding terminal value) to price per share and lifetime residual income per share to price per share for the 10 largest IPOs between 1976-2005 in terms of IPO proceeds at the time of IPO and at the end of first 9 years.

			Lifetime earnings per share to price per share									
Company name	**IPO Year**	**Status**	**IPO**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
GOLDMAN SACHS GROUP INC	1999	Surviving										
Lifetime earnings ratio excl. terminal value			2.7	1.4	1.7	2.8	4.5	3.2	2.4	1.6	1.0	1.4
Lifetime earnings ratio incl. terminal value			2.1	1.1	1.2	1.7	2.5	1.8	1.5	1.1	0.7	0.6
Residual income ratio incl. terminal value			0.8	0.4	0.6	1.3	2.3	1.6	1.0	0.6	0.4	0.8
ALLSTATE CORP	1993	Surviving										
Lifetime earnings ratio excl. terminal value			5.1	4.1	4.3	2.7	2.0	1.4	1.7	2.5	1.9	3.8
Lifetime earnings ratio incl. terminal value			3.4	2.9	3.3	2.1	1.5	1.0	1.2	1.8	1.1	1.8
Residual income ratio incl. terminal value			2.5	1.9	1.8	1.2	0.9	0.7	0.9	1.2	1.1	2.5
MOLSON COORS BEVERAGE CO	1975	Surviving										
Lifetime earnings ratio excl. terminal value			1.0	1.3	1.7	2.2	1.9	1.7	1.2	2.3	2.3	1.3
Lifetime earnings ratio incl. terminal value			1.0	1.3	1.7	2.2	1.9	1.7	1.2	2.3	2.3	1.3
Residual income ratio incl. terminal value			0.4	0.6	0.8	1.1	1.0	0.9	0.7	1.3	1.3	0.7
MONDELEZ INTERNATIONAL INC	2001	Surviving										
Lifetime earnings ratio excl. terminal value			1.7	1.9	1.7	1.9	1.3	1.3	0.8	1.2	1.9	1.9
Lifetime earnings ratio incl. terminal value			1.5	1.5	1.3	1.4	1.0	1.0	0.5	0.6	0.8	0.7
Residual income ratio incl. terminal value			0.6	0.8	0.8	1.0	0.7	0.6	0.4	0.8	1.3	1.4
APPLE INC	1980	Surviving										
Lifetime earnings ratio excl. terminal value			0.9	3.5	4.7	4.9	8.3	19.2	14.2	5.9	4.0	5.8
Lifetime earnings ratio incl. terminal value			0.8	2.6	3.2	3.6	5.4	11.4	8.1	3.5	2.7	3.7
Residual income ratio incl. terminal value			0.2	1.2	1.8	1.8	3.6	9.3	7.3	2.9	1.8	2.7
AGILENT TECHNOLOGIES INC	1999	Surviving										
Lifetime earnings ratio excl. terminal value			0.6	0.3	0.9	2.0	1.4	1.3	0.8	0.7	1.1	3.4
Lifetime earnings ratio incl. terminal value			0.5	0.1	0.4	0.8	0.6	0.7	0.5	0.4	0.4	1.1
Residual income ratio incl. terminal value			0.4	0.1	0.6	1.2	0.8	0.6	0.3	0.3	0.7	2.5
PRUDENTIAL FINANCIAL INC	2001	Surviving										
Lifetime earnings ratio excl. terminal value			4.1	4.2	3.2	1.9	1.1	1.0	1.4	6.3	3.9	3.4
Lifetime earnings ratio incl. terminal value			2.3	2.2	1.7	1.1	0.7	0.6	0.6	2.4	1.4	1.1
Residual income ratio incl. terminal value			2.0	2.3	1.7	0.9	0.5	0.5	0.9	4.2	2.7	2.4
ALCAN INC	1983	Merged										
Lifetime earnings ratio excl. terminal value			1.9	1.5	2.3	2.7	3.0	2.2	1.7	1.6	2.0	2.2
Lifetime earnings ratio incl. terminal value			1.9	1.5	2.3	2.7	3.0	2.2	1.7	1.6	2.0	2.2
Residual income ratio incl. terminal value			1.4	1.0	1.6	1.8	2.0	1.5	1.3	1.3	1.6	1.7
BURLINGTON RESOURCES INC	1988	Merged										
Lifetime earnings ratio excl. terminal value			2.4	2.0	1.5	2.1	2.3	1.8	1.8	2.3	2.3	1.9
Lifetime earnings ratio incl. terminal value			2.4	2.0	1.5	2.1	2.3	1.8	1.8	2.3	2.3	1.9
Residual income ratio incl. terminal value			1.9	1.6	1.2	1.7	1.8	1.4	1.5	1.9	1.9	1.6
SPRINT CORP	1979	Merged										
Lifetime earnings ratio excl. terminal value			3.1	2.8	2.8	2.5	2.8	2.6	2.6	2.7	2.5	2.6
Lifetime earnings ratio incl. terminal value			3.1	2.8	2.8	2.5	2.8	2.6	2.6	2.7	2.5	2.6
Residual income ratio incl. terminal value			2.3	2.1	2.1	1.9	2.1	1.9	1.9	1.9	1.7	1.7

Table 3: Number of IPOs in our sample and their age group

The table below presents the number of firms and their life in years for different groups based on their IPO year and their status. We have divided the firms in our sample into 9 groups of 5 years. Panel A shows the total number of firms in our sample, number of firms that were merged before the end of 2019, delisted for reasons other than merger before the end of 2019 and that are surviving as at the end of 2019. It also presents the total number of firms that were listed for at least 10 years, 20 years, 30 years and 40 years. Panel B reports the life of these firms in the above groups mentioned.

		Firms that were listed for at least				Firms that		
IPO Year	**# firms**	**10 years**	**20 years**	**30 years**	**40 years**	**Survived**	**Merged**	**Delisted**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Panel A : Number of firms								
1975-1979	123	60	36	14	8	8	72	43
1980-1984	1,028	436	194	100	2	64	502	462
1985-1989	1,479	664	242	134	-	121	741	617
1990-1994	2,005	777	377	11	-	237	1,070	698
1995-1999	2,481	784	357	-	-	297	1,297	887
2000-2004	772	301	51	-	-	169	416	187
2005-2009	656	307	-	-	-	215	294	147
2010-2014	825	52	-	-	-	486	236	103
2015-2019	760	-	-	-	-	670	59	31
Total	**10,129**	**3,381**	**1,257**	**259**	**10**	**2,267**	**4,687**	**3,175**
Panel B: Average life of firms								
1975-1979	14	23	29	39	43	43	12	11
1980-1984	11	21	29	35	40	35	11	8
1985-1989	11	19	28	32	-	32	10	8
1990-1994	10	19	25	29	-	27	8	8
1995-1999	8	17	22	-	-	22	7	5
2000-2004	9	16	20	-	-	18	6	6
2005-2009	8	13	-	-	-	13	6	5
2010-2014	6	10	-	-	-	7	4	4
2015-2019	3	-	-	-	-	3	2	2
Total	**9**	**18**	**25**	**33**	**42**	**14**	**8**	**7**

Table 4: Distribution of lifetime earnings to IPO price ratios for different firm groups based on IPO year and status.

The table below presents the mean, median, 25th percentile and 75th percentile of lifetime earnings per share (including and excluding terminal value) to price per share and lifetime residual income per share (including and excluding terminal value per share) to IPO offer price per share for different firm groups based on IPO year and status of the firm as at the end of 2019. We have divided the firms into 9 groups of 5 years. Firms in the '1975-1979' group are the firms which IPO'ed between 1st January 1975 and 31st December 1979. Panels A, B, C and D show these descriptive statistics about all IPO firms, surviving firms, merged firms and delisted firms in our sample. Surviving firms are the firms which exist on December 31, 2019. Merged firms are the firms which were acquired or merged before the end of 2019. Delisted firms are the firms which were delisted before the end of 2019 for reasons other than merger. Columns 2 to 5 present the statistics for the ratio of lifetime earnings (excluding terminal value) per share to IPO offer price per share. Columns 6 to 9 present the statistics for the ratio of lifetime earnings (including terminal value) per share to IPO offer price per share. Columns 10 and 11 show the percentage of the ratio attributable to market return on dividends and terminal value of the lifetime earnings (including terminal value) per share to IPO offer price per share. Columns 12 to 15 present the statistics for the ratio of lifetime residual income (excluding terminal value) per share to IPO offer price per share. Columns 16 to 19 present the statistics for the ratio of lifetime residual income (including terminal value) per share to IPO offer price per share. Columns 20 and 21 show the percentage of the ratio attributable to market return on dividends and terminal value of the lifetime residual income (including terminal value) per share to IPO offer price per share.

		LTEDPSMP				LTEDTVPSMP				LTRIPSMP				LTRIDTVPSMP			
	# firms	Mean	25th Pct	50th Pct	75th Pct	Mean	25th Pct	50th Pct	75th Pct	Mean	25th Pct	50th Pct	75th Pct	Mean	25th Pct	50th Pct	75th Pct
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Panel A: All IPO firms																	
1975-1979	123	3.2	0.1	1.2	3.0	3.2	0.1	1.2	3.0	1.6	(0.0)	0.4	1.8	1.9	0.0	0.7	2.1
1980-1984	1,028	1.1	(0.1)	0.3	1.2	1.2	(0.1)	0.3	1.2	0.8	(0.0)	0.1	0.7	0.9	(0.0)	0.2	0.9
1985-1989	1,479	1.4	(0.1)	0.5	1.7	1.5	(0.1)	0.5	1.7	0.8	(0.0)	0.1	1.0	1.1	(0.0)	0.3	1.2
1990-1994	2,005	1.3	(0.1)	0.5	1.7	1.4	(0.1)	0.5	1.7	1.0	(0.0)	0.2	1.1	1.1	(0.0)	0.4	1.3
1995-1999	2,481	0.7	(0.2)	0.2	1.1	0.8	(0.2)	0.2	1.1	0.6	(0.0)	0.1	0.8	0.7	(0.0)	0.2	0.9
2000-2004	772	0.7	(0.2)	0.1	1.1	0.9	(0.2)	0.1	1.2	0.5	(0.0)	0.0	0.6	0.7	(0.0)	0.1	1.0
2005-2009	656	0.7	(0.1)	0.4	1.2	0.9	(0.1)	0.6	1.4	0.5	(0.0)	0.0	0.8	0.8	(0.0)	0.4	1.1
2010-2014	825	0.4	(0.3)	0.2	0.8	0.9	(0.3)	0.5	1.6	0.4	(0.1)	(0.0)	0.3	0.9	(0.1)	0.3	1.4
2015-2019	760	(0.0)	(0.3)	(0.0)	0.1	0.3	(0.2)	(0.0)	0.5	0.0	(0.1)	(0.1)	(0.0)	0.3	(0.1)	(0.1)	0.4
All IPO firms	**10,129**	**0.9**	**(0.2)**	**0.2**	**1.2**	**1.1**	**(0.2)**	**0.3**	**1.4**	**0.7**	**(0.0)**	**0.0**	**0.8**	**0.9**	**(0.0)**	**0.2**	**1.1**
All IPO firms (excluding suriving IPOs after 2005)	**8,809**	**1.1**	**(0.1)**	**0.4**	**1.4**	**1.2**	**(0.1)**	**0.4**	**1.4**	**0.8**	**(0.0)**	**0.1**	**0.9**	**0.9**	**(0.0)**	**0.3**	**1.1**
Panel B: Surviving firms																	
Before 2006	947	1.6	(0.1)	0.8	2.3	2.4	(0.1)	1.0	3.1	(0.0)	(0.0)	(0.0)	0.0	1.1	(0.0)	0.3	1.2
After 2005	1,320	(0.0)	(0.3)	(0.0)	0.2	0.5	(0.3)	(0.0)	0.9	(0.1)	(0.1)	(0.1)	(0.0)	0.5	(0.1)	(0.0)	0.7
All surviving firms	**2,267**	**0.7**	**(0.2)**	**0.1**	**0.8**	**1.3**	**(0.2)**	**0.2**	**1.7**	**(0.0)**	**(0.1)**	**(0.0)**	**0.0**	**0.8**	**(0.1)**	**0.1**	**0.9**
Panel C: Merged firms**																	
1975-1979	72	4.4	1.1	1.9	3.7	4.4	1.1	1.9	3.7	2.5	0.5	1.2	2.2	2.8	0.6	1.3	2.6
1980-1984	502	1.9	0.3	0.9	1.9	1.9	0.3	0.9	1.9	1.5	0.2	0.6	1.5	1.5	0.2	0.7	1.6
1985-1989	741	2.2	0.5	1.2	2.3	2.2	0.5	1.2	2.3	1.6	0.4	0.9	1.8	1.7	0.4	1.0	1.9
1990-1994	1,070	2.1	0.4	1.2	2.3	2.1	0.4	1.2	2.3	1.8	0.4	1.0	1.9	1.9	0.5	1.0	1.9
1995-1999	1,297	1.3	0.2	0.8	1.6	1.3	0.2	0.8	1.6	1.3	0.2	0.7	1.4	1.3	0.2	0.7	1.4
2000-2004	416	1.0	(0.0)	0.5	1.5	1.0	(0.0)	0.5	1.5	0.9	0.1	0.5	1.4	0.9	0.1	0.5	1.4
2005-2009	294	1.3	0.4	1.0	1.8	1.3	0.4	1.0	1.8	1.2	0.3	0.8	1.5	1.2	0.4	0.8	1.6
2010-2014	236	1.5	0.5	1.1	1.9	1.5	0.5	1.1	1.9	1.5	0.4	1.0	1.7	1.5	0.4	1.0	1.7
2015-2019	59	1.2	0.6	1.0	1.5	1.2	0.6	1.0	1.5	1.2	0.5	0.9	1.5	1.2	0.5	0.9	1.5
All merged firms	**4,687**	**1.7**	**0.3**	**1.0**	**1.9**	**1.7**	**0.3**	**1.0**	**1.9**	**1.5**	**0.3**	**0.8**	**1.6**	**1.5**	**0.3**	**0.8**	**1.7**
Panel D: Delisted firms																	
1975-1979	43	0.6	(0.2)	(0.0)	0.8	0.6	(0.2)	(0.0)	0.8	0.3	(0.1)	(0.0)	0.1	0.4	(0.1)	(0.0)	0.2
1980-1984	462	0.1	(0.2)	(0.1)	0.1	0.1	(0.2)	(0.1)	0.1	0.1	(0.0)	(0.0)	0.0	0.1	(0.0)	(0.0)	0.0
1985-1989	617	0.0	(0.3)	(0.1)	0.1	0.0	(0.3)	(0.1)	0.1	0.0	(0.1)	(0.0)	0.0	0.1	(0.1)	(0.0)	0.0
1990-1994	698	(0.2)	(0.4)	(0.2)	0.1	(0.2)	(0.4)	(0.2)	0.1	(0.0)	(0.1)	(0.0)	0.0	0.0	(0.1)	(0.0)	0.0
1995-1999	887	(0.2)	(0.4)	(0.2)	0.0	(0.2)	(0.4)	(0.2)	0.0	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	0.0
2000-2004	187	(0.2)	(0.4)	(0.2)	(0.1)	(0.2)	(0.4)	(0.2)	(0.1)	(0.0)	(0.1)	(0.1)	(0.0)	(0.0)	(0.1)	(0.1)	(0.0)
2005-2009	147	(0.0)	(0.4)	(0.1)	0.2	(0.0)	(0.4)	(0.1)	0.2	0.0	(0.1)	(0.0)	0.0	0.0	(0.1)	(0.0)	0.0
2010-2014	103	(0.0)	(0.4)	(0.2)	0.3	(0.0)	(0.4)	(0.2)	0.3	0.1	(0.1)	(0.1)	0.0	0.1	(0.1)	(0.1)	0.1
2015-2019	31	0.0	(0.3)	(0.0)	0.0	0.0	(0.3)	(0.0)	0.0	0.0	(0.2)	(0.1)	0.0	0.0	(0.2)	(0.1)	0.0
All delisted firms	**3,175**	**(0.1)**	**(0.3)**	**(0.1)**	**0.1**	**(0.1)**	**(0.3)**	**(0.1)**	**0.1**	**0.0**	**(0.1)**	**(0.0)**	**0.0**	**0.0**	**(0.1)**	**(0.0)**	**0.0**

Table 5: Descriptive statistics of data underlying regression of lifetime earnings to IPO price

The table below presents the descriptive statistics about the variables used in our baseline regression reported in Table 6. Lifetime earnings per share to IPO price per share and residual income per share to IPO price per share both are computed as discussed in Exhibit 1 including terminal value. LT dummy is an indicator variable which is equal to 1 if the ratio of lifetime earnings per share to price per share is greater than or equal to one, otherwise zero. RI dummy is an indicator variable which is set to 1 if the ratio of residual income per share to price per share is greater than or equal to 1, otherwise zero. Size is log of market capitalization of the firm at the time of IPO. Sales to enterprise value is the ratio of total revenue to sum of market value of equity and book value of debt. SG&A expenditure represents selling, general and administrative expenditure (set to zero if missing). R&D expenditure is research and development expenditure (set to zero if missing). First year return is the stock return including dividends from the time of IPO till the end of first year after getting listed. First day return is the return including dividends for the first day of listing. Age before IPO is the number of years between founding year and IPO year. Age after IPO is the number of years between IPO year and last year of the firm's life. Survival dummy is an indicator variable which is equal to 1 if the firm exists at the end of 2019. Merger dummy is an indicator variable which is equal to 1 if the firm got merged or acquired before the end of 2019. Loss dummy is an indicator variable which is set to 1 if the first-year profits are negative, otherwise zero.

Variable	Mean	SD	P25	Median	P75
Lifetime earnings per share to price per share	1.15	3.92	(0.13)	0.37	1.42
Residual income per share to price per share	0.93	2.55	(0.02)	0.27	1.10
LT dummy	0.34	0.47	-	-	1.00
RI dummy	0.27	0.45	-	-	1.00
Size	4.57	1.43	3.51	4.55	5.56
Sales to enterprise value	0.64	0.82	0.13	0.38	0.83
SG&A expenditure	34.65	124.74	1.94	9.03	27.83
R&D expenditure	0.47	2.17	-	-	0.10
SG&A scaled by assets	0.27	0.27	0.05	0.21	0.39
R&D scaled by assets	0.03	0.12	-	-	0.00
First year return	0.05	0.59	(0.30)	(0.02)	0.25
First day return	0.15	0.38	-	0.03	0.17
Age before IPO	15.36	21.47	3.00	7.00	16.00
Age after IPO	8.39	8.31	2.00	5.00	12.00
Survival dummy	0.11	0.31	-	-	-
Merger dummy	0.53	0.50	-	1.00	1.00
Loss dummy	0.37	0.48	-	-	1.00

Table 6: Regression analysis - Lifetime earnings per share to IPO price per share

Table below shows regression results. Columns 1 to 4 show regression results where the dependent variable is LT dummy and columns 5 to 8 show results where the dependent variable is RI dummy. LT dummy, RI dummy and independent variables are explained in table 6. The empirical specification controls for industry and year fixed effects. Standard errors are clustered by year. Coefficients and t-statistics related to our hypothesis are highlighted in bold. ***, **, * denote statistical significance (two-tailed) at 1%, 5%, and 10% respectively.

Dependent Variable	**Panel A: Lifetime earnings per share**				**Panel B: Residual income per share**			
Sample	**All firms**	**Surviving firms**	**Merged firms**	**Delisted firms**	**All firms**	**Surviving firms**	**Merged firms**	**Delisted firms**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Size	**0.11*** **	**0.38*** **	**0.070***	0.055	**0.078*** **	**0.18** **	0.045	0.23
	(3.28)	(4.89)	(1.68)	(0.44)	**(2.81)**	**(1.98)**	(1.29)	(1.48)
Sales to enterprise value	**0.40*** **	**0.39*** **	**0.39*** **	**0.50*** **	**0.31*** **	**0.31** **	**0.32*** **	**0.56*** **
	(8.85)	(2.61)	(7.59)	(4.28)	(5.79)	(2.50)	(5.19)	(3.25)
SG&A expenditure	0.23	0.60	0.17	0.10	0.059	-0.26	0.084	-0.075
	(1.54)	(1.20)	(1.01)	(0.26)	(0.40)	(-0.45)	(0.58)	(-0.14)
R&D expenditure	**-0.59***	-1.73	-0.36	-1.46	-0.21	-1.06	-0.049	-1.92
	(-1.71)	(-0.86)	(-0.86)	(-0.76)	(-0.53)	(-0.50)	(-0.11)	(-1.01)
First year return	**0.69*** **	**0.37***	**0.79*** **	**0.72*** **	**0.72*** **	**0.49** **	**0.80*** **	**0.91*** **
	(5.66)	(1.74)	(6.02)	(4.16)	(7.28)	(2.37)	(7.54)	(4.26)
First day return	**0.35** **	0.19	**0.41** **	-0.19	**0.44*** **	0.29	**0.49*** **	0.15
	(2.29)	(0.77)	(2.41)	(-0.35)	(3.32)	(1.52)	(3.30)	(0.32)
Age before IPO	**0.0077*** **	**0.0088** **	**0.0063*** **	**0.015*** **	**0.0046*** **	0.00058	**0.0041** **	**0.014** **
	(4.96)	(2.42)	(3.25)	(3.42)	(2.60)	(0.17)	(2.13)	(2.42)
Age after IPO	0.0033	**-1.89*** **	-0.0075	**0.054***	**-0.021*** **	-0.87	**-0.021*** **	-0.057
	(0.51)	(-6.11)	(-1.06)	(1.91)	(-2.97)	(-1.50)	(-2.83)	(-1.56)
Survival dummy	**2.94*** **				**2.76*** **			
	(13.75)				(9.86)			
Merger dummy	**2.98*** **				**3.27*** **			
	(17.41)				(14.11)			
Loss dummy	**-0.91*** **	**-1.31*** **	**-0.85*** **	**-1.48*** **	**-0.53*** **	**-0.58** **	**-0.49*** **	**-0.96** **
	(-9.20)	(-4.55)	(-7.29)	(-3.88)	(-5.84)	(-1.96)	(-4.90)	(-2.17)
Shiller's CAPE	**-0.068*** **	**0.084***	**-0.088*** **	**-0.16** **	**-0.082*** **	0.0062	**-0.092*** **	**-0.26*** **
	(-3.53)	(1.80)	(-3.55)	(-2.43)	(-5.85)	(0.16)	(-5.05)	(-2.98)
Computers industry dummy	**-1.26** **	-1.70	-1.18	-0.93	-0.82	**-1.70*** **	**-1.33***	-1.25
	(-1.99)	(-1.57)	(-1.61)	(-0.63)	(-1.23)	(-2.71)	(-1.75)	(-1.47)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard error clustering	Year	Year	Year	Year	Year	Year	Year	Year
Number of observations	8,674	908	4,579	2,856	8,674	898	4,617	2,415
Pseudo R-squared	0.328	0.351	0.153	0.288	0.285	0.226	0.119	0.304

Table 7: Average age of firms when they reach the ratio of one

Table below presents the average number of years firms take to reach the ratio of lifetime earnings to IPO price to one and average life of firms which never reached the ratio of one. Panel A presents these numbers considering only the discounted value of lifetime earnings and Panel B presents the statistics after including merger value and terminal value. Columns 1, 2, 5 and 6 present the average number of years firm took to reach the ratio to one for all firms, surviing firms, merged firms and delisted firms by year group. Columns 3, 4, 7 and 8 show the average life of firms which never reached the ratio of lifetime earnings to IPO price to one.

	Panel A: Discounted earnings				**Panel B: Discounted earnings incl merger value and terminal value**			
	Ratio ≥ 1		**Ratio < 1**		**Ratio ≥ 1**		**Ratio < 1**	
Year group	**# firms**	**Years**	**# firms**	**Years**	**# firms**	**Years**	**# firms**	**Years**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1975-1979	26	7.81	97	10.37	68	0.96	55	12.82
1980-1984	89	9.98	939	9.44	273	2.38	755	10.01
1985-1989	192	8.70	1,287	8.13	548	1.80	931	8.56
1990-1994	250	9.69	1,755	8.02	767	1.36	1,238	9.02
1995-1999	144	10.06	2,337	6.43	680	1.57	1,801	6.66
2000-2004	69	9.23	703	7.07	216	1.19	556	7.29
2005-2009	41	8.29	615	6.83	215	1.28	441	7.00
2010-2014	23	5.57	802	4.85	288	0.30	537	5.00
2015-2019	3	2.33	757	1.61	127	0.08	633	1.56
All firms	**837**	**9.25**	**9,292**	**6.86**	**3,182**	**1.40**	**6,947**	**7.23**
IPO before 2006	382	10.84	565	23.09	485	4.91	462	23.20
IPO after 2005	44	7.05	1,276	4.53	300	0.60	1,020	4.30
Surviving firms	**426**	**10.45**	**1,841**	**10.22**	**785**	**3.26**	**1,482**	**10.19**
1975-1979	20	8.25	52	8.90	55	0.75	17	12.59
1980-1984	56	8.41	446	9.64	200	1.15	302	11.30
1985-1989	95	7.60	646	7.81	410	0.97	331	9.17
1990-1994	113	8.57	957	6.71	603	0.49	467	8.62
1995-1999	42	8.95	1,255	5.30	530	0.56	767	5.90
2000-2004	15	7.80	401	5.30	140	0.29	276	5.59
2005-2009	7	6.86	287	4.77	140	0.65	154	4.79
2010-2014			236	2.88	129	0.16	107	2.96
2015-2019			59	1.10	29	-	30	1.27
Merged firms	**348**	**8.24**	**4,339**	**6.25**	**2,236**	**0.63**	**2,451**	**7.28**
1975-1979	2	6.50	41	9.10	9	2.33	34	9.44
1980-1984	4	6.75	458	7.19	37	1.22	425	7.36
1985-1989	24	6.79	593	6.58	56	3.64	561	6.60
1990-1994	17	8.12	681	6.72	26	4.31	672	6.74
1995-1999	11	5.00	876	4.47	18	3.17	869	4.47
2000-2004	1	10.00	186	4.61	4	4.00	183	4.57
2005-2009	3	6.33	144	3.83	5	4.20	142	3.81
2010-2014	1	2.00	102	2.99	5	-	98	2.97
2015-2019			31	0.84	1	-	30	0.87
Delisted firms	**63**	**6.78**	**3,112**	**5.72**	**161**	**2.96**	**3,014**	**5.73**

Table 8: Distribution of lifetime earnings to IPO price ratios at different point of times based on status.

The table below presents the mean and median of lifetime earnings per share (including terminal value) to price per share to market price per share as defined in Exhibit 1 for different firm groups based on status of the firm. The number of firms, the mean ratio and the median ratio are computed at the beginning of the years. The rows bold highlight the pre- and post- crisis periods.

	All firms			Surviving firms			Merged firms			Delisted firms		
Year (1 Jan)	**# firms**	**Mean**	**Median**	**# firms**	**Mean**	**Median**	**# firms**	**Mean**	**Median**	**# firms**	**Mean**	**Median**
1999	3,587	1.3	0.6	703	2.0	1.2	1,721	2.0	1.1	1,163	(0.1)	(0.1)
2000	**3,516**	**1.1**	**0.3**	**755**	**1.5**	**0.8**	**1,653**	**1.6**	**0.8**	**1,108**	**(0.1)**	**(0.1)**
2001	3,098	1.6	0.6	776	2.5	1.1	1,457	2.3	1.2	865	(0.3)	(0.2)
2002	2,827	1.8	0.9	794	2.9	1.5	1,351	2.1	1.3	682	(0.1)	(0.1)
2003	**2,609**	**2.9**	**1.6**	**808**	**4.6**	**2.3**	**1,250**	**3.1**	**1.9**	**551**	**(0.1)**	**(0.1)**
2007	**2,525**	**0.9**	**0.6**	**1,039**	**0.9**	**0.7**	**1,013**	**1.4**	**1.0**	**473**	**(0.2)**	**(0.1)**
2008	2,334	1.2	0.8	1,052	1.4	1.0	904	1.6	1.1	378	(0.2)	(0.1)
2009	**2,187**	**3.5**	**1.9**	**1,067**	**4.3**	**2.3**	**833**	**3.9**	**2.4**	**287**	**(0.6)**	**(0.3)**
2010	2,124	2.1	1.4	1,132	2.4	1.6	744	2.5	1.7	248	(0.2)	(0.2)

Table 9: Comparing lifetime wealth and lifetime earnings

Panel A: Distribution of ratio of lifetime earnings to lifetime wealth

Table below shows the distribution of the ratio of lifetime earnings per share to lifetime wealth per share by year group. Year group is based on the IPO year. LTETV is the lifetime earnings per share including terminal value as explained in Exhibit 1. Lifetime wealth per share is the sum of discounted values of wealth created in each year till 2019 where wealth created in each year is CRSP return less 10 year Treasury bill rate multiplied by beginning market price per share. Detailed computation is explained in section 4. Average ratio is the mean of LTETV as a percentage to lifetime wealth per share after winsorizing the ratio at 1% and 99%. Lifetime wealth per share (adjusted with IPO price) is the sum of lifetime wealth per share and IPO price. Last column represents the mean of LTETV as a percentage of lifetime wealth per share (adjusted with IPO price) after winsorzing the ratio at 1% and 99%.

Year Group	Number of firms	LTETV	Lifetime wealth per share	Average ratio (winsorized)	Lifetime wealth per share (adjusted with IPO price)	Average ratio (winsorized)
1975-1979	7	110.58	251.63	*(1.8)*	268.71	*(13.0)*
1980-1984	55	79.23	189.40	*31.3*	204.27	*5.6*
1985-1989	116	66.94	149.68	*69.1*	164.89	*53.6*
1990-1994	229	45.15	89.46	*62.3*	104.57	*34.7*
1995-1999	289	28.16	67.38	*47.3*	82.75	*29.2*
2000-2004	163	35.62	50.25	*37.5*	66.28	*55.3*
2005-2009	210	21.18	33.19	*69.4*	48.43	*28.6*
2010-2014	473	16.00	13.14	*86.9*	28.76	*46.5*
2015-2019	640	5.33	4.04	*52.8*	17.45	*18.7*
	2,182	**24.11**	**42.83**	***61.1***	**57.68**	***32.9***

Panel B: Comparing lifetime earnings and lifetime wealth for top firms

The table below presents the lifetime wealth per share and lifetime earnings per share for the firms which are in the top 50 either based on lifetime wealth per share or lifetime earnings per share. We compute the discounted lifetime earnings per share in Column 2 including terminal value as discussed in the Exhibit 1. To compute lifetime wealth per share in Column 1, we use Bessembinder's (2018) wealth creation equation (3). However, we compute the wealth at the per share level instead of firm level. The wealth is computed for one share purchased at the time of IPO. Wealth is defined as the excess return over treasury bill rate on one IPO share. This wealth is computed for each month during the life of the firm and discounted at treasury bill rate plus 5% as used for discounting lifetime earnings. Column 4 represents lifetime wealth including IPO price and therefore, we add IPO price to the lifetime wealth per share. Columns 3 and 5 presents the lifetime earnings as a percentage to two measures of lifetime wealth per share.

Company Name	IPO Yea	Lifetime wealth per share	Lifetime earnings including term val	% of lifetime earnings to lifetime wealth	Lifetime wealth per share (adding back IPO price)	% of lifetime earnings to lifetime wealth
		(1)	(2)	(3) = (2)/(1)*100	(4)	(5) = (2)/(4)*100
AMAZON.COM INC	1997	5,879	453	*7.7*	5,897	*7.7*
MICROSOFT CORP	1986	5,456	1,815	*33.3*	5,477	*33.1*
HOME DEPOT INC	1981	5,150	1,575	*30.6*	5,162	*30.5*
CISCO SYSTEMS INC	1990	3,666	1,462	*39.9*	3,684	*39.7*
ADOBE INC	1986	2,017	376	*18.7*	2,028	*18.6*
NETFLIX INC	2002	1,848	366	*19.8*	1,863	*19.7*
MASTERCARD INC	2006	1,607	456	*28.4*	1,646	*27.7*
STRYKER CORP	1979	1,453	419	*28.9*	1,467	*28.6*
ALPHABET INC	2004	1,329	1,087	*81.8*	1,414	*76.8*
COGNIZANT TECH SOLUTIONS	1998	1,197	636	*53.2*	1,207	*52.7*
STARBUCKS CORP	1992	1,171	474	*40.5*	1,188	*39.9*
FASTENAL CO	1987	1,085	381	*35.1*	1,094	*34.8*
AMGEN INC	1983	1,037	419	*40.4*	1,054	*39.7*
EBAY INC	1998	888	292	*32.9*	906	*32.3*
QUALCOMM INC	1991	865	401	*46.3*	881	*45.5*
NVIDIA CORP	1999	865	205	*23.7*	885	*23.2*
UNITEDHEALTH GROUP INC	1984	801	278	*34.7*	806	*34.5*
AUTOZONE INC	1991	795	475	*59.7*	818	*58.0*
MICROCHIP TECHNOLOGY INC	1993	684	274	*40.0*	697	*39.3*
APPLE INC	1980	682	215	*31.6*	710	*30.3*
IDEXX LABS INC	1991	674	137	*20.3*	689	*19.8*
O'REILLY AUTOMOTIVE INC	1993	663	432	*65.3*	680	*63.6*
INTUIT INC	1993	630	223	*35.4*	650	*34.4*
POOL CORP	1995	624	195	*31.2*	635	*30.7*
RESMED INC	1995	614	144	*23.4*	625	*23.0*
CME GROUP INC	2002	603	355	*58.9*	638	*55.6*
PRICE (T. ROWE) GROUP	1986	564	342	*60.7*	588	*58.2*
CERNER CORP	1986	555	184	*33.1*	571	*32.1*
ROPER TECHNOLOGIES INC	1992	546	331	*60.6*	561	*59.0*
GILEAD SCIENCES INC	1992	520	470	*90.4*	535	*87.8*
FISERV INC	1986	510	132	*25.9*	523	*25.3*
CITRIX SYSTEMS INC	1995	499	189	*37.9*	514	*36.8*
CREDIT ACCEPTANCE CORP	1992	453	474	*104.7*	466	*101.8*
CHIPOTLE MEXICAN GRILL INC	2006	447	101	*22.7*	469	*21.6*
VISA INC	2008	442	300	*67.8*	499	*60.2*
AUTODESK INC	1985	414	63	*15.3*	426	*14.9*
COPART INC	1994	414	158	*38.3*	426	*37.2*
SEI INVESTMENTS CO	1981	403	173	*42.9*	422	*41.0*
BIOGEN INC	1991	391	237	*60.7*	406	*58.5*
HARLEY-DAVIDSON INC	1986	385	285	*74.1*	396	*72.1*
NETAPP INC	1995	380	153	*40.4*	393	*39.0*
TRANSDIGM GROUP INC	2006	378	101	*26.7*	399	*25.3*
SCHWAB (CHARLES) CORP	1987	376	172	*45.9*	392	*43.9*
DOLLAR TREE INC	1995	374	165	*44.1*	389	*42.4*
CANADIAN NATIONAL RAILWAY	1995	367	313	*85.4*	408	*76.8*
FACTSET RESEARCH SYSTEMS IN	1996	360	137	*38.2*	380	*36.2*
TRACTOR SUPPLY CO	1994	356	221	*62.3*	376	*59.0*
AXON ENTERPRISE INC	2001	351	16	*4.6*	364	*4.5*
PENN NATIONAL GAMING INC	1994	334	25	*7.6*	344	*7.4*
ELECTRONIC ARTS INC	1989	321	98	*30.5*	329	*29.7*
MORGAN STANLEY	1986	271	338	*124.7*	299	*112.8*
SERVISFIRST BANCSHARES INC	2014	127	313	*246.6*	136	*230.3*
GLACIER BANCORP INC	1984	164	310	*188.7*	182	*170.2*
HYATT HOTELS CORP	2009	44	297	*676.9*	62	*479.8*
GREAT SOUTHERN BANCORP	1989	184	287	*156.2*	198	*145.2*
VMWARE INC -CL A	2007	55	280	*513.5*	66	*427.3*
GAP INC	1976	314	276	*87.9*	340	*81.3*
XBIOTECH INC	2015	(2)	275	*(14,540.3)*	15	*1,818.8*
CENTENE CORP	2001	310	275	*88.7*	332	*82.8*
ATHENE HOLDING LTD	2016	(3)	259	*(9,091.1)*	4	*6,545.2*
ANTHEM INC	2001	257	227	*88.3*	268	*84.6*
ARISTA NETWORKS INC	2014	119	197	*164.7*	176	*111.8*
HCA HEALTHCARE INC	2011	89	181	*203.4*	104	*174.1*
LANDSTAR SYSTEM INC	1993	221	179	*81.2*	226	*79.2*
RH	2012	130	179	*137.3*	145	*123.1*

Table 10: Lifetime earnings per share and lifetime wealth pre- and post-crisis

Table below shows the distribution of the ratio of lifetime earnings per share to lifetime wealth per share by year group. Year group is based on the IPO year. LTETV is the lifetime earnings per share including terminal value as explained in Exhibit 1. Lifetime wealth per share is the sum of discounted values of wealth created in each year till 2019 where wealth created in each year is CRSP return less 10-year Treasury bill rate multiplied by beginning market price per share. Detailed computation is explained in section 4. Average ratio is the mean of LTETV as a percentage to lifetime wealth per share after winsorizing the ratio at 1% and 99%. Lifetime wealth per share (adjusted with IPO price) is the sum of lifetime wealth per share and IPO price. Last column represents the mean of LTETV as a percentage of lifetime wealth per share (adjusted with IPO price) after winsorzing the ratio at 1% and 99%.

		Mean		Median	
From the date of IPO to the beginning of	#firms	Lifetime wealth per share (including IPO price)	Lifetime earnings per share (including terminal value and market return on dividends)	Lifetime wealth per share (including IPO price)	Lifetime earnings per share (including terminal value and market return on dividends)
2000	3,663	26.00	10.49	6.44	2.49
2003	2,893	18.98	9.26	6.63	1.79
2007	2,610	32.20	16.81	13.76	4.90
2009	2,362	24.00	14.36	8.30	3.24
2020	2,182	57.68	24.11	18.35	2.85