Stylized facts on the evolution of profit rates in the U.S.: Evidence from firm-level data

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Abstract

This paper builds on the literature analyzing the aggregate profit rate to describe profitability across the distribution of firms in the post-1970 U.S. economy. While median profitability mirrors well-established aggregate patterns, including a falling rate of profit through the mid-1980s and a recovery thereafter, it also masks a striking post-1980 widening of the distribution. In this paper, we document this widening of the profitability distribution, and identify factors driving changes in profit rates at each end of the distribution. At the top, we show that, while top-end operational profit rates (operational returns on tangible capital) soar after 1980, this rise disappears when accounting for financial and intangible assets. We show that firms with high operational profit rates hold large stocks of financial and intangible assets, relative to those with high total profitability, but that larger shares of these assets fail to translate into higher returns on all assets. Thus, once accounting for post-1980 changes in asset composition, growth in top profit rates disappears. At the bottom, profit rates of the least profitable quintile of U.S. nonfinancial corporations become systematically and increasingly negative after the early 1980s. We show that this decline reflects persistently negative average profitability in new post-1970 cohorts, rather than falling profitability within continuing firms.

JEL Codes: B5, L1
Keywords: Profit rates, intangible assets, cash, entry dynamics

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1 Introduction

An important focus of research in macroeconomics and political economy is the evolution of the profit rate over time. The post-war U.S. economy is characterized both by a falling aggregate rate of profit through the 1980s (Weisskopf, 1979; Shaikh, 1987; Michl, 1988a,b; Duménil & Lévy, 2002) and a subsequent recovery since the mid-1980s (Wolff, 2001, 2003; Duménil & Lévy, 2011; Basu & Vasudevan, 2013). These changes are of central importance to theories of investment, growth and technical change, and also help explain the historical evolution of the U.S. economy. Accordingly, the causes of the falling rate of profit through the 1980s have been the subject of substantial work and debate,[1] and the subsequent rise in profitability also yields insight into the recent experience of the U.S. economy. Michl (2016, 2017), for example, links rising profitability during the neoliberal period, slow growth, and a new brand of corporate capitalism, in which managers increasingly release funds to financial markets (specifically, the stock market). Michl's analysis suggests, in turn, that connections between profitability and the changes in firms' asset composition highlighted by research on financialization and intangibles require further investigation.

In this paper, we build on the large body of work that analyzes the macroeconomic behavior of the profit rate by using firm-level data to describe the evolution of profitability across the distribution of firms in the post-1970 U.S. economy. Firm-level data allows us to not only document the evolution of profitability at a single part of the distribution (for instance, the median or average), but also to distinguish the experiences of the most and least profitable firms in the U.S. economy. To do so, we consider two measures of the profit rate. First, we measure a firm's *total profit rate*, defined by total net earnings (whether from operational or nonoperational activities) relative to total assets. In the spirit of Michl (1988a), this definition considers both total capital income (both financial and operational earnings) and a broad measure of tangible, financial, and intangible capital (see also Basu & Vasudevan, 2013). Second, we measure firms' *operational profit rates*, defined more narrowly as operational returns on tangible capital.

Consistent with the literature using aggregate data, we show that median profitability falls

[1]For example, Michl (1988a) distinguishes two stages in this decline, wherein a declining profit share during the initial post-war period accounted for the decline in the profit rate, whereas the years from 1972 to 1986 saw a rising profit share and falling capital productivity (see also, for example, Weisskopf, 1979).

through the mid-1980s and subsequently recovers, regardless of how we define the profit rate. Median profitability is, therefore, quite stable when viewed over the full post-1970 period. This long-term stability is consistent with Marxian perspectives in which competitive forces drive profit rates to a long-run equilibrium (e.g. Shaikh, 2016; Tsoulfidis & Tsaliki, 2005). By using firm-level data, however, we also document a post-1980 widening of the profitability distribution that is masked in aggregate data. At the bottom of the distribution, profit rates become systematically (and increasingly) negative after the early 1980s. At the top of the distribution, the story is more complicated: while top-end operational profitability soars after 1980, top-end total profit rates are steady. This growing discrepancy between top-end total and operational profit rates raises the question of how to reconcile these conflicting trends, and best describe changes in top-end profitability in the neoliberal period.

We, next, establish two stylized facts that help explain these trends at the top and bottom of the profitability distribution. At the top, we show both descriptively and using linear probability models that a main driver of the growing wedge between profitability in total versus operational terms lies in the differential acquisition of financial and intangible assets by firms across the distribution. Specifically, we build on Davis & de Souza (2021) to show that firms at the top of the operational profitability distribution hold relatively large stocks of financial and intangible assets. However, because they do not earn returns on these assets commensurate to those on tangible capital, these financial and intangible assets inflate the denominator of total profitability without generating a proportional increase in profit flows (the numerator). The consequence is that these ostensibly 'top' firms are decreasingly likely to also have top-end total profit rates.

We also consider if changes in the industrial composition of the nonfinancial corporate sector explain these differences at the top. For example, one may expect that firms in technology-intensive industries hold little tangible capital, but large stocks of intangibles. If these firms sit at the top of the operational, but not total, profitability distributions, then growth in technology-intensive industries may underlie the widening divergence between top-end operational and total profit rates. We show, however, that the divergence between the two groups of top-ranked firms is not the result of structural change and, instead, reflects a shift in asset composition within most industries in the

corporate sector. Thus, as nonfinancial firms' portfolio shares of financial and intangible assets have grown, narrow measures of returns on tangible capital have become increasingly limited measures of top firms' true returns on assets. These results link the evolution of top-end profit rates to widespread growth in financial and intangible assets (Davis, 2016; Orhangazi, 2019), as well as to a growing disconnect between operational profitability and tangible investment – often termed the 'investment-profit puzzle' (e.g. Stockhammer, 2005).

Second, we turn to the bottom of the distribution and show that declining profitability among the least profitable quintile of firms reflects increasingly and persistently negative profit flows among new firms entering the nonfinancial corporate sector. Not only has each post-1970 cohort of entering firms entered with lower profitability than the cohort before it, but these profitability differentials are also persistent. Thus, rather than crashing profit rates within a segment of continuing firms over time, declining bottom-end profitability reflects the entry of increasingly unprofitable firms. This result speaks to a strand of the literature that emphasizes the role of entry in driving post-1980 increases in idiosyncratic risk, changes in firm survival rates, and growth in cash and debt (Fama & French, 2004; Brown & Kapadia, 2007; Davis, de Souza & Hernandez, 2021). In addition, the result that firms increasingly enter the nonfinancial corporate sector with negative net earnings speaks to evidence of rising post-1980 share of financially fragile ('zombie' or 'Ponzi') firms that are unable to cover their debt servicing costs (Banerjee & Hofmann, 2018; Davis, de Souza & Hernandez, 2019).

The paper is organized as follows: In Section 2, we introduce our data and document trends at the top, middle, and bottom of the total and operational profitability distributions. To begin unpacking differences between total and operational profitability, we also describe the asset composition of the most and least profitable firms. In Sections 3 and 4 we turn to drivers of top- and bottom-end profit rates, respectively. Section 5 concludes.

2 The evolution of profitability over time

2.1 Measuring total and operational profitability

We follow the application of two definitions of the profit rate to firm-level data from the CRSP/Compustat Merged (CCM) database in Davis & de Souza (2021) between 1971 and 2017. First, we consider a broad concept of *total profitability* that accounts for a firm's total net earnings (from both core operations and non-operational activities) relative to its total assets. Second, we compare total profitability to a narrower concept of *operational profitability*, defined by a firm's operational income flows relative to its stock of tangible capital.

To measure *total profitability*, we define total profit flows (the numerator) as the sum of after-tax operating and non-operating income. Operating income measures a firm's total sales before depreciation and after both the cost of goods sold and general and administrative expense. Non-operating income includes all other income flows (for example, interest and dividend income). Because non-operating income includes interest income, but neither operating nor non-operating income are net of interest expense, we also deduct interest expense from total profits. Finally, we deduct income taxes to capture net income accruing to the firm (see, for example, Duménil & Lévy, 2002).

We normalize these profit flows by the total pool of assets on which they are earned, which includes tangible, financial, and intangible assets. Tangible assets are the sum of fixed capital (property, plant and equipment net of depreciation) and inventories. Financial assets include cash and short-term investments, investments and advances, receivables, and other miscellaneous assets (for details, see Davis, 2016). Intangibles include both 'identifiable' intangibles (such as customer lists, patents and copyrights) and goodwill (which includes all non-identifiable intangibles) (Crouzet & Eberly, 2019; Orhangazi, 2019). Notably, intangibles are primarily created through mergers and acquisitions (M&As), rather than internal accumulation. This convention reflects US accounting guidelines, wherein externally acquired intangibles (such as those created by M&A activity) are reported on the balance sheet as assets, whereas internally acquired intangibles (such as those created through research and development) are instead recorded as expenses on the income

statement (Rizova & Saito, 2020).[2] As such, balance sheet intangibles tend to reflect M&A activity, rather than being a byproduct of investment in physical capital.

Operational profitability considers, more narrowly, operational income relative to tangible capital. In this case, we restrict profit flows to operational income, defined again by operating income before depreciation and after both income taxes and interest expense, and we normalize operational profits by tangible assets. Both total and operational profitability, therefore, define the profit rate as returns on assets advanced, independently of firms' financing decisions (put differently, we define profitability as a return on assets, rather than a return on net worth).[3] Finally, we trim each profitability measure at the 1st and 99th percentiles to account for outliers.[4]

Our final sample is the same as in Davis & de Souza (2021), and includes all firms with non-missing profitability data after excluding financial firms, firms incorporated outside of the U.S., and observations with negative sales or total assets.[5] We also use CCM to identify firms' year of entry, and merge CCM with delisting codes from the Center for Research in Security Prices (CRSP) database (on fiscal year and firm, *permco*) to identify firms' year of exit. We classify firms as entering in the fiscal year they join the dataset and exiting in the fiscal year they report a delisting code, conditional on that they also report profitability data in those years. We also consider a firm as entering if its profitability reporting lags its entry by one year (and as exiting if its last year of reporting leads its exit by one year). Doing so accounts for timing discrepancies between a firm's month of entry (or exit) and the first (or last) fiscal year in which it reports income and balance sheet data.[6]

[2] According to Rizova & Saito (2020), US generally accepted accounting principles (GAAP) makes this distinction because internally developed intangibles do not go through a market assessment, whereas externally acquired intangibles are evaluated in (and therefore priced by) the M&A market.

[3] In CCM identifiers, the total profit rate is $(oibdp + nopi - txt - xint)/(at)$ and the operational profit rate is $(oibdp - txt - xint)/(ppent + invent)$. Financial assets are the sum of cash and short-term investments (*che*); investments and advances (*ivaeq* and *ivao*); and other assets (*aco* and *ao*). Intangibles are *intan*.

[4] We also consider an alternative trimming procedure that weeds out extreme observations driven by small asset bases, while allowing firms with very top-end profit rates that are not driven by small denominators to remain in the sample. Rather than trimming the full top and bottom percentiles of each distribution, this alternative procedure only drops observations from the top and bottom percentiles of operational profitability and total profitability that are also in the bottom decile of total assets (for total profitability) or the capital stock (for operational profitability) in a given year. The trends we show below are robust to this alternative procedure.

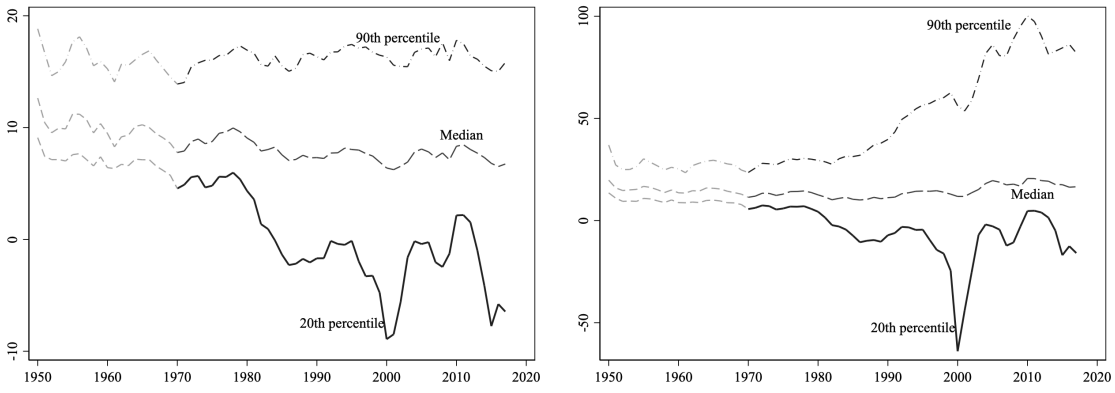
[5] We use *fic* to identify country of incorporation, and SIC codes 6000-6799 to identify financial firms. We also drop the 41 firms that switch into or out of finance, and limit the sample to primary issues (*linkprim* of P or C), which cover over 99% of CCM observations.

[6] For instance, firms that go public in March and report fiscal-year-end information in May, are unlikely to report

2.2 The evolution of top, median, and bottom profit rates

Figure 1 begins by plotting the evolution of profitability at the 90th, 50th, and 20th percentiles of the total and operational profitability distributions from 1950 to 2017. These figures highlight that, on the one hand, median profitability is quite stable when viewed over the full post-1950 period (in both total and operational terms). At the same time, however, the profit rate distribution widens, due to declining profitability at the bottom and – in the case of operational profitability – rapidly rising profit rates at the top.[7] While small sample size prevents us from using pre-1970 data in the rest of the paper, the 1950s and 1960s help to clearly highlight that post-1980 years mark a break from pre-1980 trends after which time profit rate dispersion grows.

Figure 1: The 20th, 50th, and 90th percentiles of profitability (1950-2017)



(a) Total profitability **(b)** Operational profitability

Notes: The figure shows trends in the 90th, 50th, and 20th percentiles of total and operational profitability between 1950 and 2017, in percentages. Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. Each profit rate is trimmed at the 1st and the 99th percentiles separately for 1950-1969 and 1970-2017. For details describing the data and sample, see Section 2.1.

To begin, both measures of median profitability decline through the mid-1980s (although these

profitability data in the year of entry. By allowing a one year lag, we avoid excluding this firm from our sample. Nonetheless, the vast majority of firms report income and balance sheet data contemporaneously with entry (97.7% of entering firms) and exit (96.8% of exiting firms) (Davis & de Souza, 2021). We drop firms for which the length of this lag or lead exceeds one year, and firms with gaps in profitability (such that one firm cannot 'enter' multiple times). When firms have multiple securities that delist at different times (383 firms), we assign their year of exit based on its last security to delist, and we drop firms with multiple securities that delist in the same month and year but for different reasons (eleven firms).

[7] The trend is very similar for the bottom decile of firms; however, we emphasize the bottom quintile because the magnitude of negative profitability at the bottom decile makes the scale difficult to interpret.

declines are difficult to see on this scale). Median total profitability falls from an average of 10.5% in the 1950s to 7.9% by the 1980s, and the decline in median operational profitability – from 15.7% in the 1950s to 10.9% in the 1980s – is even more pronounced. Both medians reach local minimums in 1986, after which total profitability remains close to its mid-1980s level and operational profitability recovers, moderately surpassing its 1950s levels at a post-2000 average of 17.2%. These trends – particularly in the operational profit rate – mirror macroeconomic evidence of a falling rate of profit through the early 1980s (Shaikh, 1987; Michl, 1988a; Duménil & Lévy, 2002) and a subsequent recovery (Wolff, 2001; Duménil & Lévy, 2011; Basu & Vasudevan, 2013). Median profitability is, therefore, quite stable over the full post-1950 period in both total and operational terms.

Despite stability at the median, however, Figure 1 also highlights that the profitability distribution widens after 1980 due to falling bottom-end profit rates and, in the case of operational profitability, rising profitability at the top. After declining moderately through the 1950s and 1960s, the 20th percentiles of both profit rates drop appreciably in the 1970s and are negative in most years after 1980. At its 20th percentile, total profitability falls from a pre-1980 average of 6.4% to first become negative in 1984, averaging -2.3% per year thereafter. Similarly, the 20th percentile of operational profitability averages 8.6% between 1950 and 1980; becomes negative in 1982; and averages -9.7% per year thereafter. Thus, the gap between the least profitable firms and those at the median widens markedly after the mid-1980s for both profit rates.

At the top, the picture is more complicated. On the one hand, Figure 1a shows that the 90th percentile of *total* profitability hovers near its post-1950 average of 16.2% in each year. Accordingly, top-end firms have approximately twice the total profit rates of the median firm over the full post-1950 period. This pattern speaks to the expectation of the classical paradigm, wherein – even in the absence of equalization across firms – competitive forces generate regularity in the across-firm distribution of profit rates and limit dispersion (for firm-level empirical evidence, see Scharfenaker & Semieniuk, 2017; Davis & de Souza, 2021).

On the other hand, Figure 1b shows that top-end *operational* profit rates begin to rise dramatically in the 1980s and accelerate during the 1990s and 2000s. Operational profitability at the 90th

percentile, which averages 27.7% between 1950 and 1980, reaches 53.5% in the 1990s; 75.1% in the first decade of the 2000s; and 88.1% since 2010. As a result, firms at the 90th percentile are almost five times more profitable in operational terms than the median firm by 2017. In stark contrast to total profitability, Figure 1b therefore suggests that top firms in the U.S. economy have rapidly pulled away from the rest of the sector, yielding a large-scale increase in dispersion driven by both the top and the bottom of the distribution.

2.3 How do the distributions of total and operational profitability intersect?

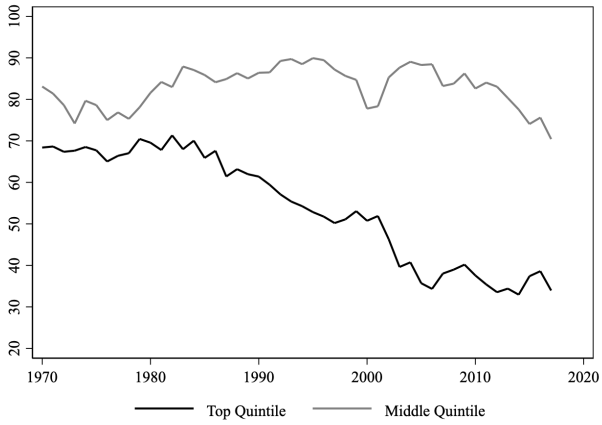
Understanding the post-1980 evolution of profitability, particularly for top-end firms, requires reconciling differences between the total and operational profitability distributions. As a first step, we ask whether the *same firms* tend to sit at the top and bottom of each profitability distribution. We show that, while the same firms tend to lie at the bottom of both distributions, firms with top operational profit rates are decreasingly likely to also have top-end total profit rates, suggesting systematic differences in financial and intangible asset holdings depending on where firms rank in the profitability distribution.

Figure 2 describes the overlap in the two profitability distributions by plotting the shares of firms in the top and bottom quintiles of total profitability that are in the same quintile of operational profitability.[8] We refer to this share as the 'overlap rate' at a given quintile. Figure 2 highlights, most notably, a decline in the top quintile's overlap rate from the early 1980s: While almost 70% of firms in the top quintile of top profitability are also in the top quintile of operational profitability in the 1970s, this share falls beginning in the early 1980s and averages only 36% since 2005. As such, just more than one third of firms in the top quintile of the total profitability distribution are also at the top end of the operational profitability distribution in recent years. In contrast, the overlap rate at the bottom quintile exceeds 70% for the full post-1970 period. This relatively high overlap rate at the bottom reflects that the bottom quintile of both measures intersects closely with the set of firms earning negative profits.[9] Thus, the top quintile increasingly consists of different

[8] Davis & de Souza (2021) show similar calculations for the top quintile of firms, but first rank firms by operational (rather than total) profitability. This difference does not qualitatively affect the trends in the overlap rate, although the precise shares differ due to missing observations.

[9] More specifically, approximately 20% of firms have negative net income from 1971 through 2000. The post-2000

Figure 2: Percent overlap between firms ranked by total and operational profitability, by quintile



Notes: The figure shows the share (%) of firms in the top and bottom quintile of total profitability that are in the same quintile when ranked by operational profitability. Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. For details describing the data and sample, see Section 2.1.

firms depending on how profitability is measured, but this divergence has not occurred for the least profitable firms.

The decline in the top quintile's overlap rate suggests that asset composition may underlie the divergent trends in top-end total and operational profitability, and thereby give insight into the evolution of top profit rates in the U.S. economy. The primary difference between these two measures of the profit rate is that total profitability includes financial and intangible (in addition to tangible) assets in the denominator. While total profitability also includes nonoperating income in the numerator, nonoperating income is a small share of total profits (averaging 7.5% and 6.1% of profits for firms in the top quintiles of total and operational profitability, respectively). Thus, the declining overlap rate suggests that firms with top operational profit rates may increasingly hold *less* tangible capital, and more intangible and financial capital, relative to those with the highest total profit rates.

These patterns are captured by Table 1, which records the average shares of intangible and financial assets in total assets held by firms in the top and bottom quintiles of each profitability

decline in the overlap rate at the bottom quintile shown in Figure 2 captures that *more* than 20% of nonfinancial corporations have negative net income since 2000.

measure. Among firms in the top quintile of operational profitability, average intangibles rise from less than 5% of total assets in the 1970s to approximately a third (34.6%) since 2010. Financial asset holdings are steadier over time, averaging 54.5% of total assets between 1971 and 2017. Thus, only 14.8% of these firms' assets are, on average, tangible capital since 2010. These shares of non-tangible assets are high, relative both to firms with top-end total profit rates and relative to less profitable firms. Between 2010 and 2017, firms with top-end total profit rates hold an average of 18.0% of their assets as intangibles and 40.7% as financial assets, such that tangible capital is a far larger share of assets (almost 40%). In turn, the discrepancy between top-end total and operational profitability indicates that, once accounting for these large stocks of intangible and financial assets (which both increase the denominator of the total profit rate), top-ranked firms by operational profitability are increasingly unlikely to remain at the top of the distribution.

Table 1: Mean shares of intangible and financial assets in total assets

	Firms in the top quintile of profitability measure					
	Intangible Assets		Financial Assets		Cash	
	Total Profitability	Operational Profitability	Total Profitability	Operational Profitability	Total Profitability	Operational Profitability
1971-1979	2.5	4.5	37.8	47.3	12.1	14.1
1980-1989	2.4	4.2	43.2	54.8	15.3	18.6
1990-1999	5.5	10.7	47.8	62.3	16.8	22.4
2000-2009	12.5	24.6	43.7	56.4	17.2	23.3
2010-2017	18.0	34.6	40.7	50.6	17.4	22.6
	Firms in the bottom quintile of profitability measure					
	Intangible Assets		Financial Assets		Cash	
	Total Profitability	Operational Profitability	Total Profitability	Operational Profitability	Total Profitability	Operational Profitability
1971-1979	3.0	2.2	40.3	34.4	7.3	6.8
1980-1989	3.6	3.6	48.5	50.6	18.3	20.4
1990-1999	6.4	6.4	57.9	60.0	29.4	30.9
2000-2009	11.5	12.3	62.7	64.2	40.3	41.0
2010-2017	10.8	11.3	65.2	59.3	46.6	38.5

Notes: The table shows the % shares of financial and intangible assets for firms in the top and bottom quintiles of operational profitability and of total profitability by decade. Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. Financial assets are the sum of cash and short-term investments, investments and advances, receivables, current assets, and other assets. For details describing the data and sample, see Section 2.1.

Finally, Table 1 yields insight into profitability at the bottom quintile. Most importantly, the

least profitable firms increasingly hold larger average shares of financial assets and, in particular, cash than highly profitable firms. Since 1980, firms in the bottom quintiles of total and operational profitability have approximately one third (an average of 32.8% and 32.2%) of their assets in cash, with these shares rising over time to reach 46.6% and 38.5% since 2010. In contrast, cash only accounts for 16.6% and 21.7% of the assets of firms with top-end total and operational profit rates since 1980. Cash also dominates the least-profitable firms' total financial assets. Since 2010, for example, cash constitutes 71.4% of the financial assets of firms in the bottom quintile of total profitability and 65.0% of those of firms in the bottom quintile of operational profitability (while less than half of top firms' financial assets are cash). As we discuss further in Section 4, high cash holdings among these unprofitable firms may reflect that these firms tend to have recently entered the corporate sector, and received a cash infusion from their initial public offering (IPO).

3 Top-end profitability: the roles of asset composition and sector

To investigate these trends in more detail, we begin at the top of the distribution. Section 2 highlights a dramatic distinction in top-end profit rates when profitability is measured in total or operational terms, and suggests that differences in financial and intangible asset shares among these two groups of top-end firms may underlie this difference. In this section, we explore this possibility further in two steps. First, we use a regression-based analysis, which shows that larger shares of financial and intangible assets *lower* the probability that a firm in the top quintile of operational profitability is also in the top quintile of the total profitability distribution. Thus, the average firm with top-end operational profitability earns lower returns on its financial and intangible assets relative to those on tangible capital, such that larger shares of these non-tangible assets reduce the likelihood it is also at the top of the total profitability distribution. Second, we draw on across-firm variation to show that firms with top-end operational profitability have also shifted their portfolios towards financial and intangible assets more quickly than firms with top-end total profitability.

We also consider the potentially intersecting explanation that changes in the industrial composition of the nonfinancial corporate sector – for example, growth in intangible-intensive industries – contributes to the declining overlap rate at the top quintile. However, we show that the declin-

ing overlap rate at the top quintile reflects widespread *within-sector* divergence between the firms ranked as highly profitable by total and operational profitability, rather than structural change.

Together, the analysis in this section indicates that the patterns in top-end profit rates documented in Section 2 are dominated by within-industry growth in the intangible and financial asset holdings of firms with top-end operational profits. Once accounting for changes in asset composition and these firms' relatively large shares of intangible and financial assets, the majority of firms that appear to be 'top' firms in narrow operational terms are no longer at the top of the distribution.

3.1 The role of financial and intangible assets: regression results

In Table 2 we show linear probability models that ask whether high shares of intangible and financial assets lower the probability that firms in the top quintile of operational profitability are *also* in the top quintile of total profitability. To do so, we limit our focus to firm-year observations in the top quintile of operational profitability, and define the dependent variable to equal one if a firm is *also* in the top quintile of total profitability in that year. In other words, the dependent variable is the 'overlap probability' for an individual firm.

Our independent variables of interest are the shares of intangible and financial assets in total assets. Thus, the regression coefficients describe the impact of a one percentage point increase in these asset shares on the likelihood that a firm is at the top of both profitability distributions (and multiplying the coefficients by one hundred gives this impact in percentage point terms). Negative coefficients indicate that the declining overlap rate at the top quintile reflects higher intangible and financial asset holdings among firms with top-end operational profit rates. We also include firm and year fixed effects to account for constant firm-level characteristics (like industry) and common time-varying trends, and cluster the standard errors by firm and year. Notably, we do not control for the composition of net revenues and, therefore, allow for net revenues to vary when estimating the impacts of changes in the composition of assets. Thus, these estimations use within-firm variation in asset holdings and profitability to describe the association between changes in asset composition and the average firm's overlap probability, while controlling for fixed firm characteristics that may be systematically correlated with across-firm differences in asset composition.

Table 2: Probability that a firm in the top quintile of operational profitability is in the top quintile of total profitability

	(1) LPM	(2) LPM	(3) LPM	(4) Logit
Intangibles (% assets)	-0.014	-0.015	-0.015	-0.015
	(0.001)***	(0.001)***	(0.000)***	(0.000)***
Fin. Assets (% assets)	-0.010		-0.012	-0.011
	(0.001)***		(0.000)***	(0.000)***
Cash (% assets)		-0.009		
		(0.001)***		
Other Fin. Assets (% assets)		-0.011		
		(0.001)***		
Observations	30208	30208	32084	32084
Effect of +1 s.d. (within-firm, in p.p.):				
Intangibles (% assets)	-11.7	-12.0	-12.7	-12.3
Fin. Assets (% assets)	-9.4		-11.1	-10.9
Cash (% assets)		-8.7		
Other Fin. Assets (% assets)		-9.8		
Firm FE	Y	Y	N	N
Year FE	Y	Y	Y	Y
Industry FE	N	N	Y	Y
Two-way clustering	Y	Y	Y	N

Notes: The regressions include all firm-year observations in the top quintile of operational profitability, where dependent variable is an indicator variable that equals one if the firm is also in the top quintile of total profitability in that year. Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. Financial assets are the sum of cash and short-term investments, investments and advances, receivables, current assets, and other assets. For details describing the data and sample, see Section 2.1.

The results show that higher shares of both intangible and financial assets meaningfully lower the probability that a firm in the top quintile of the operational profitability distribution also has a top-end total profit rate. In Column 1, a one percentage point increase in the share of intangibles is associated with a statistically significant 1.4 percentage point lower likelihood of this overlap probability for firms in the top quintile of operational profitability. A one percentage point rise in the share of financial assets is, similarly, associated with a one percentage point decline in this overlap probability. These estimates are large in economic terms: One standard deviation increases in the shares of intangible and financial assets are associated with declines in the overlap probability of 11.7 percentage points and 9.4 percentage points, respectively.[10] Relative to the average overlap

[10]Since OLS regression coefficients use within-firm variation, these magnitudes are based on within-firm standard deviations (8.26 percentage points for intangibles and 9.54 for financial assets). To estimate these standard deviations, we regress the shares of intangible and financial assets on a full set of firm and year dummies (Mummolo & Peterson,

rate of 55%, these magnitudes are large.

In Columns 2-4, we show robustness to three alternative specifications. First, in Column 2 we distinguish cash from non-cash financial assets. In doing so, we consider if cash holdings drive the negative relationship between financial assets and firms' overlap probability, while non-cash financial assets may increase this probability if they are a notable source of financial profits. However, the coefficients on cash and non-cash financial assets have the same sign and similar magnitudes. Thus, for the average firm with top-end operational profitability, cash and non-cash financial assets impose similar drags on returns. Column 3 shows that these results are robust to replacing firm with industry fixed effects, and Column 4 shows robustness to a panel logistic specification, also with industry fixed effects.[11]

Thus, larger shares of financial and intangible assets play a notable role in driving the growing wedge between top-end operational and total profitability: when the average firm in the top quintile of the operational profitability increases its holdings of financial and intangible assets, these increases fail to translate into higher returns on all assets. As such, larger shares of non-tangible assets make this firm more likely to also fall out of the top quintile of total profitability.

3.2 The role of financial and intangible assets: across-firm variation

Next, we build on these regression results to show that firms with top-end operational profit rates have also acquired financial and intangible assets *more quickly* than those with top-end total profitability. Furthermore, relative to the typical firm with top-end operational profits, firms at the top of *both* profitability distributions hold small shares of financial and intangible assets. These patterns corroborate the conclusion that the divergent evolution of top-end operational and total profit rates documented in Section 2 reflects differences in asset composition between these two groups of top firms.

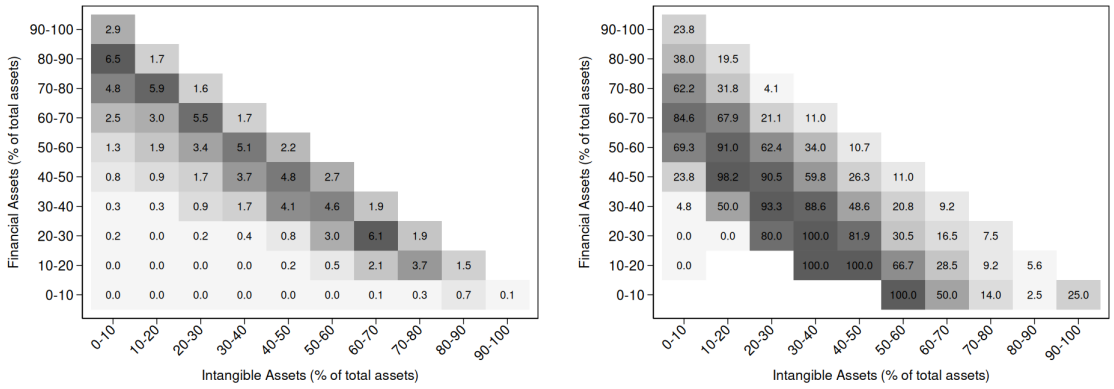
We begin by comparing the asset composition of firms that are top-ranked only by operational

2018). These regression residuals, which give the variation in asset shares after removing time-fixed differences across firms and time-specific common effects, are plausible ranges of within-firm variation.

[11] We do not estimate a logistic model with firm fixed effects. Since a large share of firms in the top quintile by operational profitability are either never (or always) in the top quintile of total profitability, the observations for these firms are dropped in the maximum likelihood estimation procedure, such that the results are not comparable to the OLS estimates.

profitability to that of firms in the top quintile of both measures. To do so, we classify firms in the top quintile of operational profits into bins defined by ten percentage points ranges of their portfolio shares of financial and intangible assets. We show these bins in Figure 3 with shares of intangible and financial assets on the axes, such that bins closer to the upper diagonals have total shares of financial and intangible assets closer to 100%. Figure 3 focuses on the last years of our sample from 2010 to 2017 (we subsequently show that the main patterns hold over time in Figure 4, below).

Figure 3: Asset composition of firms in top quintile of operational profits (Annual averages, 2010-2017)



(a) Distribution of firms (in % of total firms)

(b) Overlap rate (in % of firms in bin)

Notes: Each box is a bin defined by ten percentage point intervals of financial assets (on the vertical axis) and intangible assets (on the horizontal axis), each as a share of total assets. We classify each firm in the top quintile of operational profitability into one bin in each year. Panel a reports the number of firms in each bin as a percentage of firms in the top quintile of operational profitability. Panel b reports the share of those firms that also in top the quintile of total. Each ratio is averaged from 2010-2017. For details describing the data and sample, see Section 2.1.

Figure 3 shows two ratios for each bin. First, Figure 3a reports the number of firms in each bin as a percentage of firms in the top quintile of operational profitability (i.e. the distribution of highly profitable firms across these asset share bins). Second, Figure 3b reports the number of firms in each bin that are *also* in the top quintile of total profitability (i.e. that overlap), as a ratio of the number of firms in that bin. In each case, darker shading shows that a larger share of firms falls into that box. Consider, for example, the bin for which both intangibles and financial assets are 40-50% of assets. Figure 3 reports that, between 2010 and 2017, this bin accounts for an

average of 4.8% of firms in the top quintile of profitability, while Figure 3 shows that, on average, 26.3% of firms in this bin are also in the top quintile of total profitability.

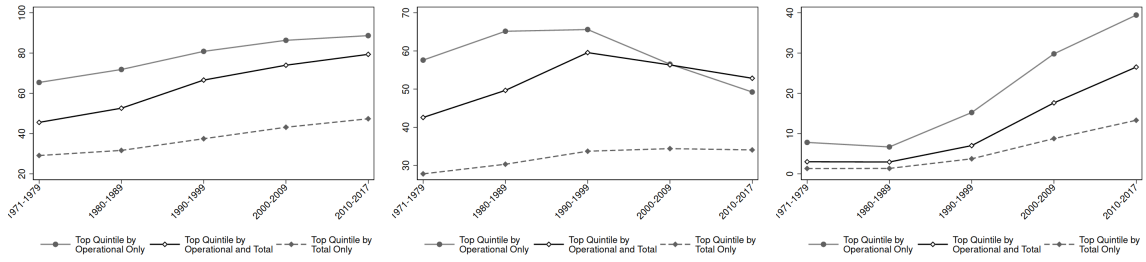
Figure 3 captures two patterns. First, firms with top-end operational profit rates are concentrated along the upper diagonal in Figure 3a, highlighting that their portfolios are dominated by financial and intangible assets. For instance, 85.3% of firms in the top quintile of operational profitability fall into the 27 bins (of 55 total) for which financial and intangible assets are at least 75% of total assets. In contrast, only 4.1% of these top firms have total shares of intangible and financial assets below 40 percent. Thus, firms with top-end operational profit rates tend to have portfolios that are highly dominated by financial and intangible assets.

Second, the firms with top-end operational profit rates that also hold large stocks of financial and intangible assets are relatively unlikely to also have high total profitability. In particular, Figure 3 shows that the highest overlap rates between the two sets of top-ranked firms are along a ridge to the left of where firms with top-end operational profit rates tend to fall. Thus, the firms most likely to sit in the top quintile of both distributions have *lower* financial and intangible asset shares than the typical firm with top-end operational profit rates. For example, in the bins with total financial and intangible asset shares between 50 and 80 percent, the (weighted) average overlap rate is 64.8%. In contrast, the overlap rate is less than one third (30.5%) in the 27 bins where, as described above, most firms are concentrated.

Finally, Figure 4 shows that these patterns generalize to previous periods by plotting the average shares of intangible and financial assets by decade for three groups of firms: firms in the top quintiles of *both* operational and total profitability; firms only in the top quintile of operational profitability; and firms only in the top quintile of operational profitability. Figure 4a shows that firms that are only top-ranked by operational profitability consistently hold higher average shares of intangibles and financial assets than firms that are top-ranked by both measures. Even as these asset shares rise over time within each group of firms, this ranking is preserved in each decade. In turn, Figures 4b and c show that this ranking also holds independently for intangible and (until the 2000s) financial assets. Specifically, differences in asset composition between highly profitable firms primarily reflect financial assets until the 1990s. In turn, as intangibles grow after 2000 (and

the average share of financial assets among top-ranked firms by operational profitability declines), differences in intangible assets become dominant.

Figure 4: Average shares of financial and intangible assets for highly profitable firms by decade



(a) Financial and intangible assets **(b)** Financial assets **(c)** Intangible assets

Notes: The figure shows financial and intangible assets as a percent of total assets for firms in the top quintile of both operational and total profitability; firms in the top quintile of operational profitability only; and firms in the top quintile of operational profitability only. Each point is averaged across firms and periods. Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. For details describing the data and sample, see Section 2.1.

Together with the regression results in Section 3.1, these patterns indicate that widening differences in asset composition underlie the post-1980 divergence in top-end total and operational profit rates. These changes in asset composition may, for example, reflect churning in the two groups of firms, wherein firms breaking into the ranks of highly profitable firms have had asset compositions that are systematically different from those of incumbent and exiting firms.[12] The result is that, by 2017, the typical firm with high operational profitability holds relatively large shares of intangible and financial assets, which drag on total profitability, while the typical firm with high total profitability has correspondingly lower shares of those assets and achieves high total returns at the cost of lowering its measured returns on physical capital.

[12]See Davis & de Souza (2021) for an analysis of churning in the post-1970 evolution of top-end total profitability. Firms in the top quintile by operational profitability tend to be younger than those in the top quintile by total profitability, and the difference in average tenure in our sample between the two groups rises from 0.65 year in the 1970s to 2.67 years in the 2000s. As shown in Alti (2006) and Davis et al. (2021), younger firms typically hold higher shares of financial assets, partly as a result of the cash infusion from the IPO.

3.3 Does structural change explain the divergence at the top?

The discussion in Sections 3.1 and 3.2 indicates that portfolio composition underlies the declining overlap rate, such that – after measuring returns on firms' total stocks of tangible, intangible, and financial capital – rising top-end profitability disappears. We, next, ask if changes in the industrial composition of highly profitable firms also cast light on these divergent paths in top-end total and operational profitability. If this divergence is driven by growth in industries that are intangible-intensive (or, conversely, a contraction of traditionally fixed capital-intensive industries like manufacturing), then the role of asset composition highlighted above may capture structural change, rather than an across-the-board shift in asset structure. We show, however, that the declining overlap rate at the top quintile is primarily explained by *within*-industry changes, rather than the growth of industries in which firms have high operational profitability and hold disproportionately large stocks of intangible and/or financial assets.

We begin with a shift share decomposition distinguishing the shares of the decline in the overlap rate coming from within-industry versus structural (between-industry) changes. The within-industry component isolates declines in the overlap rate taking place within industries while holding the size of each industry constant. Conversely, the structural change component captures the extent to which the declining overlap rate reflects the growth of industries in which firms with high total profitability are less likely to also have high operational profitability (now holding the overlap rate within each industry constant). We include details on the shift share method in Appendix A.[13]

We summarize the results in Table 3. The first column shows the percentage point change in the overlap rate at the top quintile by decade. As shown in Figure 2, the overlap rate falls in each decade after 1980, with the largest declines between 1980 and 2009. In turn, the second and third columns isolate the roles of within- and between-industry change in this decline. This decomposition highlights that, between 1980 and 2009, the declining overlap rate entirely reflects changes *within* industries, which reduce the overlap rate by an average of 9.8 percentage points per

[13] We include thirteen industries based on SIC codes, three of which are high-tech industries (high-tech manufacturing, communications services, and software and computer-related services) defined using the legacy definitions of the CompTIA foundation (formerly TechAmerica) (see Engelen, Neumann & Schmidt, 2016; Davis et al., 2019). High-tech manufacturing includes, for example, industrial and consumer electronics, semiconductors, and electromedical equipment. Software and computer services includes information retrieval services and prepackaged software.

Table 3: Shift-share decomposition of changes in the overlap rate at the top quintile

	Δ firm overlap rate (p.p.)	Decomposition (in p.p.)	
		Within industry	Structural change
1970-1979	2.1	1.5	0.5
1980-1989	-7.6	-8.6	1.0
1990-1999	-8.3	-11.0	2.6
2000-2009	-10.6	-10.0	-0.6
2010-2017	-3.6	0.6	-4.2

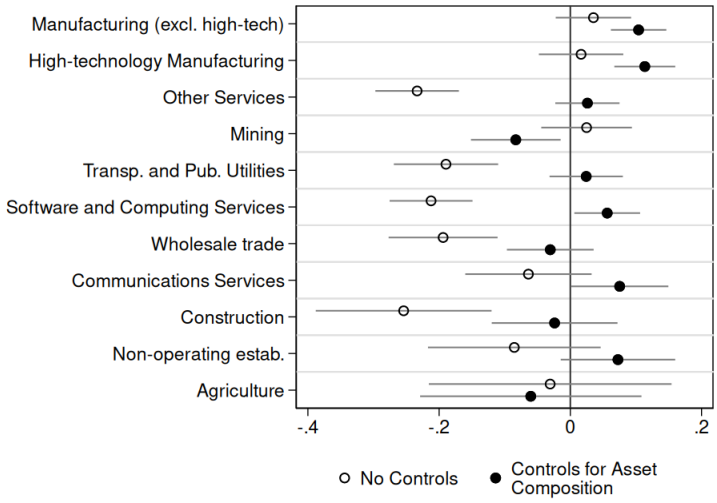
Notes: The first column shows the percentage point (p.p.) change in the share of firms in the top quintile of total profitability that are also in the top quintile of operational profitability. The second and third columns decompose this change into within-industry and structural change components, also in percentage points. For details on the industrial classification and shift-share methodology, see Appendix A. For details describing the data and sample, see Section 2.1.

decade. Structural change, in fact, slightly counteracts this within-industry decline, concurrently offsetting the overlap rate by an average of one percentage point per decade. While this pattern reverses since 2010, the decline in the overlap rate during these years is appreciably lower than during the previous three decades. Thus, the divergence between the two groups of top firms appears to be a generalized phenomenon taking place across industries, rather than the result of relative growth in intangible-intensive (or tangible-unintensive) industries.

Finally, to visualize the roles of specific industries in this result, we use the regression framework from Section 3.1 to ask whether belonging to specific industries enhances the probability that a firm ranks at the top of both profit rate measures. The results, shown in Figure 5, are striking: despite differences in firms' unconditional overlap probability across industries, industry ceases to be a strong predictor of this probability after controlling for asset composition. Specifically, Figure 5 shows the point estimates for industry dummies in a linear model of the probability that a firm in the top quintile of operational profitability is also in the top quintile of total profitability, where each coefficient is reported relative to retail trade. The white dots show these coefficients when controlling for year effects but not asset composition. In turn, the black dots show these estimates when also controlling for the shares of intangible and financial assets.[14] We also report 95% confidence intervals. While the unconditional effects of most industries are large and statistically significant, conditioning on asset composition collapses almost all industry coefficients to near-zero

[14]We report coefficients for intangible and financial assets in Column 4 of Table 2.

Figure 5: Overlap rate at the top quintile, estimates for industry dummies



Notes: The figure shows the point estimates (relative to retail trade) for industry dummies in a linear model of the probability that a firm in the top quintile of operational profitability is also in the top quintile of total profitability (corresponding to column 3 in table 2). The white dots show the coefficients when controlling for year effects, but *without* controls for asset composition. In turn, the black dots show the estimates for industry dummies when also controlling for the shares of intangible and financial assets. The lines represent 95% confidence intervals. For details describing the data and sample, see Section 2.1.

(and statistically insignificant) values.[15]

Together, the results in Section 3 highlight that the growing divergence between top-end operational and total profitability reflects growth in financial and intangible assets over the post-1980 period. Because these asset shares have not grown equally across the profitability distribution, most firms with top-end operational profit rates are not 'top' firms once accounting for their total assets. In notable contrast, across-industry differences in portfolio composition do not predict these differences. Thus, operational profitability does an increasingly poor job of capturing overall returns on assets, and understanding the evolution of profitability at the top requires accounting for these shifts in asset holdings.

[15]The only exceptions are traditional and high-tech manufacturing, which retain statistically significant positive effects, although of much smaller magnitudes. For example, the coefficient for traditional manufacturing (relative to retail) shrinks from approximately 30 percentage points in the unconditional regression to less than 5 percentage points after controlling for asset composition.

4 Falling bottom-end profitability and new entry

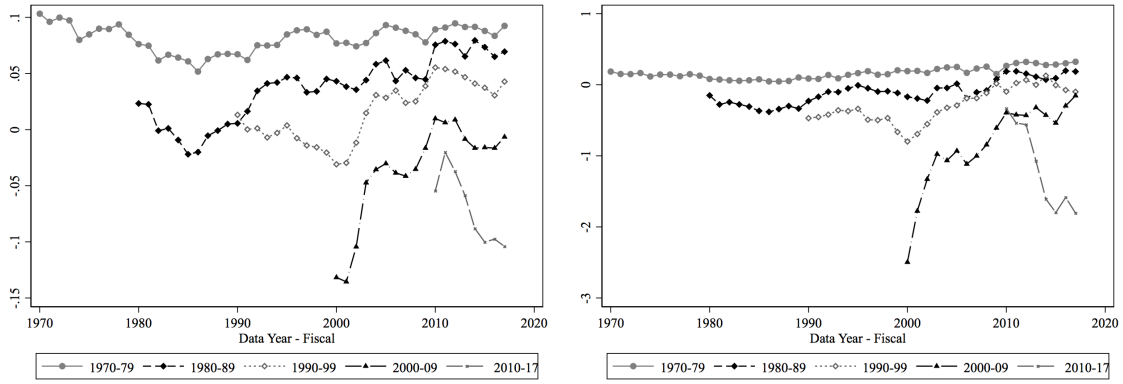
Finally, we show that a key reason for falling profit rates at the bottom of the distribution is that new firms have entered the nonfinancial corporate sector with increasingly negative profitability. Thus, rather than an increasingly stringent competitive environment in which 'losing' firms become unprofitable over time, falling and negative profitability at the bottom reflects waves of new entry by increasingly unprofitable firms. This explanation is, furthermore, common to both measures of the profit rate: this trend is driven by the numerators of both measures, which are negative in the bottom quintile whether profit flows include only operational, or both operational and non-operational, net income.

In Figure 6, we show the evolution of profitability within five cohorts of firms entering the nonfinancial corporate sector since 1970 . We define each cohort by decade (with the exception of the most recent cohort, which is from 2010-2017), and classify firms into cohorts if they enter during that ten-year interval (see Brown & Kapadia, 2007, for a similar analysis of entry cohorts to analyze rising idiosyncratic risk). By tracking profitability within each cohort over time, we consider if firms in more recent cohorts enter with lower average profit rates and, if so, whether these differentials are persistent over time. If new cohorts enter with increasingly negative profitability *and* this differential relative to previous entrants is sustained over time, these patterns indicate that negative and falling bottom-end profit rates reflect an increasingly unprofitable segment of firms accessing equity finance.

Figure 6 highlights two key points: First, each post-1970 cohort of new firms tends to enter with lower average profitability than the cohort before them.[16] Second, despite rising within-cohort profitability over time, level differences between cohorts persist over time. Consider Figure 6a, which plots average total profitability within each cohort. Among firms entering in the 1970s, total profitability is consistently positive, averaging 7.9% between 1970 and 2017. In contrast, the

[16]The exception is firms entering in 2000, among which profitability is low relative not only lower to firms entering in 2010, but also relative to all other observations. However, it is important to keep in mind, first, that the first year of data for each cohort describes a smaller number of firms than later years (e.g. this data point only includes firms that enter in 2000, whereas the 2005 data point for the same cohort includes firms entering between 2000 and 2005. Second, because firms that enter in 2000 enter during the Dot Com bust, their low profitability in 2000-2001 – as well as the substantial rise in this cohort's average profitability in 2002 – are unsurprising.

Figure 6: Average profitability within cohorts of entering firms



(a) Total profitability **(b)** Operational profitability

Notes: The figure shows average total and operational profitability in five cohorts of firms entering the nonfinancial corporate sector. Each firm is classified into one cohort based on its year of entry (1970-1979, 1980-1989, 1990-1999, 2000-2009, 2010-2017). Total profitability is the sum of operating and nonoperating income, after income taxes and interest payments, relative to assets. Operational profitability is operating income before depreciation, after income taxes and interest payments, relative to fixed capital and inventories. For details describing the data and sample, see Section 2.1.

average total profitability of firms entering in the 1980s and 1990s is slightly negative upon entry, averaging -0.50% in the decade of entry for firms entering in the 1980s and -0.87% for firms entering in the 1990s. While total profitability within the 1980s and 1990s cohorts rises over time to reach an average of 5.4% between 2010 and 2017, it remains markedly lower than average profitability within the 1970s cohort during these years (which averages 9.0%). Thus, level differences with respect to the 1970s cohort persist. In turn, average total profitability of firms entering between 2000 and 2009 is -4.9% in the decade of entry and -0.3% between 2010 and 2017. Among firms entering after 2010, average total profitability falls to -8.4%.

Thus, new waves of increasingly and persistently unprofitable firms contribute to falling bottom-end profitability after 1980. Exit by unprofitable firms also plays an important role in driving within-cohort profitability increases over time. Firms in the bottom quintile of both profitability distributions, which overlap closely with the set of *un*profitable firms, have a high propensity to exit relative to other firms in the nonfinancial corporate sector. For instance, an average of 12.8% of firms in the bottom quintile of the total profitability distribution exits annually between 1980

and 2017, versus 7.3% across the full sample and 5.3% of firms in the top quintile.[17] The exit of unprofitable firms helps explain rising within-cohort profitability over time: as unprofitable firms drop out, average profitability measured across the remaining firms in each cohort rises. Thus, rising within-cohort profitability among the set of highly unprofitable firms need not capture life cycle effects wherein firms with negative profitability converge towards the rest of the sector over time and can, instead, be explained by simple compositional effects.

5 Concluding discussion

In this paper, we show that relative stability in the median profit rate over the post-1950 period in the U.S. economy masks a large-scale increase in dispersion since the mid-1980s. Not only do the least profitable corporations in the U.S. economy increasingly lagged behind the median firm, but a growing wedge has also emerged between rapidly rising top-end *operational* profit rates and top-end *total* profit rates, which are largely stable.

We establish two stylized facts to help explain these trends in top- and bottom-end profitability. First, we link the growing discrepancy between top-end total and operational profitability to the fact that firms with top-end operational profit rates hold outsized shares of financial and intangible assets, relative to firms with top-end total profit rates. These conclusions highlight that the evolution of top-end profitability is closely linked to well-documented growth in financial and intangible assets holdings by U.S. corporations (e.g. Davis, 2016; Orhangazi, 2019; Crouzet & Eberly, 2019). Our analysis builds on this literature to furthermore highlight that growth in non-tangible assets has been nonuniform across the profitability distribution. In turn, the fact that rapidly rising top-end profitability dissipates when accounting for a broad measure of capital indicates that operational profitability is an increasingly limited measure of top firms' overall returns on assets.

[17] These shares are similar for the bottom quintile of operational profitability, in which an average of 13.3% of firms in the bottom quintile of operational profitability exit annually, as compared to 7.2% of the full sample and 6.1% of the top quintile. Firms' reasons for exit also vary substantially between the top and bottom quintiles. Based on a firm's delisting code, we can distinguish between firms that exit 'for cause' (i.e. due to bankruptcy), through mergers, and voluntarily (e.g. in going private transactions) (see Fama & French, 2004, for the classification of delisting codes). Across the distribution, voluntary exits constitute a very small share of total exits (see also Doidge, Karolyi & Stulz, 2017; Davis & de Souza, 2021). In the bottom quintile of total profitability, for instance, an average of 9.2% of firms exit for cause and only 3.2% exit in mergers after 1980. In contrast, top-end exits are dominated by merger activity, with only 0.6% of firms in the top quintile exiting for cause and 4.6% exiting in a merger.

These patterns in top-end profit rates also speak to evidence of an 'investment-profit puzzle', wherein growing profitability since the mid-1980s is concurrent with a slowdown in investment (Stockhammer, 2005; Van Treeck, 2008; Orhangazi, 2019) and in GDP growth (Michl, 2017). In line with Orhangazi (2019), for example, intangible assets may complement top firms' operational activities and enable them to earn high returns on tangible capital even without commensurate investments in physical capital. For instance, the acquisition of intangibles may be increasingly intertwined with competitive pressures on growing firms – even if these intangibles eventually imply that firms' returns on total assets fall. Similarly, the fact that intangibles tend to be created through merger activity (rather than internal growth), suggests that this investment-profit puzzle could reflect new growth strategies wherein top firms increasingly expand via acquisitions. These acquisitions create balance sheet intangibles, which depress firms' total profitability, but may support top firms' operational profit rates.

Second, we show that falling bottom-end profit rates reflect an increasingly unprofitable segment of firms has accessed to equity finance – not declining profitability within continuing firms over time (for example, due to risky financing strategies, poor investments, or stringent competition from more successful firms). These results build on work emphasizing the importance of entry and cohort effects for a series of post-1980 changes in the nonfinancial corporate sector. For example, Brown & Kapadia (2007) trace rising firm-level risk to the entry of new firms after 1980, and Fama & French (2004) find that a less profitable and riskier segment of firms entered the corporate sector during the 1990s. Similarly, Davis et al. (2021) show that changing practices surrounding the IPO have disseminated new, and increasingly fragile, financial norms during the 1980s and 1990s.

Falling profit rates at the bottom of the distribution are also closely tied to rising financial fragility. The decline in bottom-end profitability has been concurrent with growth in the shares of 'Ponzi' or 'zombie' firms that are unable to cover their debt servicing costs with current income (Davis et al., 2019; Banerjee & Hofmann, 2018). Davis et al. (2019) show, in particular, that growth in the share of Ponzi firms reflects firms *entering* the nonfinancial corporate sector with negative net income. Thus, the set of firms with declining (and negative) profit rates at the bottom of the profitability distribution intersects closely with these financially fragile firms, highlighting links

between entry, declining bottom-end profit rates, and rising financial fragility.

Finally, these stylized facts raise questions for future research. First, persistently negative profitability among entering firms appears to counter the expectation that capital seeks out high current returns. The link between declining bottom-end profitability and new entry, therefore, raises questions about the industries into which these firms enter and how entering firms' profit rates compare to the prevailing profit rate within that industry; the role of uncertainty over future returns; and the role of increased merger activity in driving the entry of unprofitable firms. Second, while we focus on the 90th percentile, the literature on superstar firms (Autor, Dorn, Katz, Patterson & Van Reenen, 2020) suggests that what is happening at the very top of the distribution (e.g. the 99th percentile) may require independent investigation. The answers to these questions can, in turn, inform our understanding of competition, structural change, and profitability in the post-1980 U.S. context.

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A Shift share decomposition

In Section 3.3 we decompose the change in the overlap rate between the two groups of highly profitable firms into the contributions of within-industry versus structural (between-industry) changes using a shift share decomposition. We divide the sample into thirteen industries using the major divisions of the Standard Industry Classification (SIC) and also the three high-tech industries described in Section 3.3 (summarized in Table A1).

Table A1: Industry Classification

Industry	SIC Code	Industry	SIC Code
Agriculture, Forestry and Fishing	0100-0999	Other Services	7000-8999[a]
Mining	1000-1499	Non-operating Establishments	9995
Construction	1500-1799	Conglomerates	9997
Manufacturing (excl. High tech.)	2000-3999[b]		
Transportation and Public Utilities	4000-4999[c]	High-technology Manufacturing	3571, 3572,3575,3577-3579,3651,
Wholesale Trade	5000-5199		3652,3661,3663,3669,3671,3672,
Retail Trade	5200-5999		3675-3679,3674,3821-3826,3829,
			3827,3861,3812,3844,3845
		Communications Services	4812-4813,4841,4899
		Software and Computing Services	7371-7379

Notes: The SIC codes for High-technology Manufacturing, Communications Services, and Software and Computing Services follow the legacy classification of the CompTIA foundation (formerly TechAmerica). The legacy classification could be originally accessed at http://www.techamerica.org/sic-definition. For examples of papers using this classification, see Engelen et al. (2016); Davis et al. (2019).

[a] Excludes the codes listed under Software and Computing Services.
[b] Excludes the codes listed under High-technology Manufacturing
[c] Excludes the codes listed under Communications Services.

Let i denote industry; $S_{i,t}$ denote the share of industry i among the firms in the top quintile of total profitability at time t; and $O_{i,t}$ denote the share of firms in the top quintile of total profitability at time t that are also in the top quintile of operational profitability (the overlap rate). Let the change in the overlap rate between times $t-k$ and t be denoted by ΔO_t. Simple algebraic manipulation yields the following decomposition:

$$\Delta O_t = \sum_i \bar{S}_i \Delta O_{i,t} + \sum_i \bar{O}_i \Delta S_{i,t} \tag{1}$$

where a bar over a variable denotes its average between times t and $t-k$. The first term in Equation 1 is the sum of changes in the overlap rate within each industry, weighted by the average share of that industry among the firms in the top quintile of total profitability. This term captures the within-sector component of the change in the aggregate overlap rate. The second term is the sum of changes in the share of each industry among the firms in the top quintile of total profitability, weighted by the average overlap rate within that industry.[18] This term captures structural change. We decompose the change in the overlap rate between the initial and final year of each period.

[18]Shift-share decompositions are not unique, and typical alternatives use as weights the values observed at the initial (at $t-k$) and final (at t) periods, instead of averages across these two periods. Our results are robust to these alternative specifications.