

# The evolution of financial fragility: A quantile decomposition of firm balance sheets

Leila E. Davis\*

Joao Paulo A. de Souza†

Gonzalo Hernandez‡

## Abstract

The post-1980 period has seen sustained changes in the balance sheet structure of the average nonfinancial corporation in the U.S., but also important heterogeneity across firms. In this paper, we analyze the proximate causes of changes in firm balance sheet structure, while taking explicit account of this across-firm heterogeneity. First, we describe the intersection between financial fragility, defined by firms' ability to generate cash flows to service financial obligations, and balance sheet structure. Second, we analyze whether observed trends in financial behavior reflect changing within-firm financial practices, or changes in the composition of firms. We use a two-step quantile decomposition to disentangle the contribution of continuing firms to the evolution of firm financing behavior, from changes in the sample due to entry and exit. We find that aggregate changes in balance sheets are driven primarily by compositional changes produced by incoming and outgoing firms, rather than by the changing behavior of continuing firms. The compositional effects are particularly strong among more financially fragile firms. The crucial roles of entry and exit suggests a key role for ‘churning’ and, in particular, changing IPO behavior, as a key mechanism through which changing financial norms are realized in the post-1980 nonfinancial corporate sector. These results, also, help us reconcile two apparently inconsistent stylized facts of the post-1980 period: first, a growing incidence of financially fragile firms with insufficient cash inflows to meet financial commitments and, second, declining indebtedness and increased liquid financial asset holdings among these same firms.

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\*Department of Economics, Middlebury College, [ldavis@middlebury.edu](mailto:ldavis@middlebury.edu).

†Department of Economics, Middlebury College, [jdesouza@middlebury.edu](mailto:jdesouza@middlebury.edu).

‡Department of Economics, Pontificia Universidad Javeriana, [gonzalo.hernandez@javeriana.edu.co](mailto:gonzalo.hernandez@javeriana.edu.co).

# 1 Introduction

The post-1980 period in the U.S. economy has seen sustained changes in the financial behavior of nonfinancial corporations (NFCs), as well as important heterogeneity in these changes across firms. Changing in financial behavior is reflected in long-term shifts in the structure of NFC balance sheets, which point to the ‘financialization’ of nonfinancial corporations and, importantly, have been linked to key nonfinancial outcomes, including fixed investment rates (see Davis, 2017, for a survey). Of particular note are both an across-the-distribution increase in cash holdings and changing patterns of outstanding financial obligations. For example, mean cash holdings across NFCs have grown from 4.2% to 13.9% of sales between 1980 and 2014.<sup>1</sup> This increase in cash holdings, in turn, has implications for understanding the concurrent evolution of leverage. Bates, Kahle & Stulz (2009) show, for instance, that cash growth is so dramatic that, by 2006, the average firm could retire all outstanding debt with its cash. Accordingly, while average debt relative to equity or total assets is approximately constant, average *net* debt (debt less cash holdings) declines after the early 1980s (Kahle & Stulz, 2017).

Concurrently, there has been a striking increase in cash flow-based measures of financial fragility. Consider, specifically, a Minskian framework, which defines financial fragility by the relationship between firms’ operational cash flows and obligatory financial commitments (Minsky, 1964, 1986).<sup>2</sup> In this framework, the most financially fragile (‘Ponzi’) firms are unable to cover either interest or principal obligations with current income, such that they must roll both into future debt. Davis, de Souza & Hernandez (2017) highlight a marked increase in the incidence of Ponzi finance among U.S. NFCs, from 10.8% in 1970 to 31.5% between 1970 and 2014. Thus, by 2014, almost a third of NFCs have sufficiently fragile financing structures that they are unable to cover *either* interest *or* principal commitments with current income. This increased incidence of Ponzi finance, furthermore, takes place concurrently with declining indebtedness and rising cash holdings among these same Ponzi firms – even though they are, by definition, unable to meet their financial commitments with current income. The fact that continuing Ponzi firms are instead expected to become increasingly leveraged and to decumulate cash suggests that trends in Ponzi firms’ balance sheets are primarily produced by entry and exit (into the sample or regime category), rather than by within firm changes over time.

Similar questions regarding the relative roles of entry/exit, versus within-firm behavioral changes, arise for the full nonfinancial corporate sector. On the one hand, the existing literature has identified a set of within-firm explanations for post-1980 changes in firm balance sheet structure. Corporate cash holdings

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<sup>1</sup>These are weighted means based on Compustat data.

<sup>2</sup>See Minsky (1986, Ch.9) for an introduction to the Financial Instability Hypothesis. A large theoretical and institutional literature, in turn, follows in this Minskian tradition; for a survey, see Nikolaidi & Stockhammer (2017).

have, for example, been linked to tax costs associated with repatriating profits earned abroad (Foley, Hartzell, Titman & Twite, 2007); rising idiosyncratic risk (Bates et al., 2009); and competitive strategies wherein cash is held as a means of acquiring future market share (Fresard, 2010). On the other hand, however, there have also been notable changes in the composition of the nonfinancial corporate sector, and substantive changes in the dynamics of entry and exit in recent decades. For example, the number of public firms peaked in the mid-1990s, after which time entry rates declined (Decker, Haltiwanger, Jarmin & Miranda, 2016a,b) and de-listing rates rose due, in part, to elevated merger activity (Doidge, Karolyi & Stulz, 2017). In turn, product markets have become increasingly concentrated (Autor, Dorn, Katz, Patterson & Van Reenen, 2017; De Loecker & Eeckhout, 2017; Furman, 2016), and public corporations have become more R&D intensive, older, and larger (Kahle & Stulz, 2017).

Together, these trends suggest that entry and exit—and, specifically, differences in the financial structure of incoming/outgoing versus continuing firms—may play a key role in the post-1980 evolution of firm balance sheets, both for the full sector and among financially fragile ('Ponzi') firms. In this paper, we analyze this possibility by decomposing changes in NFC cash holdings and financial obligations (debt and total liabilities) over time to disentangle the effect of *changes in the composition of firms* on the evolution of NFC financial structure, from the effect of *within-firm changes* in behavior. We, first, perform these decompositions for the full nonfinancial corporate sector, to analyze if there is an important role for 'churning' caused by entry and exit in driving aggregate trends. Second, we turn to sub-samples of firms defined by Minskian measures of financial fragility, to analyze the intersection between the evolution of firms' balance sheets and this cash flow-based measure of fragility.

Our decomposition methodology consists of two steps. In both steps we utilize quantile decomposition methods to decompose the evolution of these variables across their full distributions, rather than only at the mean. Via these quantile methods, we take into account the fact that the distributions of both cash and liabilities are highly skewed.<sup>3</sup> In the first step, we use a re-weighting approach in the spirit of DiNardo, Fortin & Lemieux (1996) to disaggregate the contributions of continuing firms (the within-firm effect), and of incoming/outgoing firms (the compositional effect) to changes in cash holdings and financial obligations over time. We also use this re-weighting method to further disaggregate the compositional effect into the independent roles of incoming and outgoing firms. In the second step, we focus primarily on Ponzi firms and implement a detailed decomposition to differentiate the ways firms can be incoming or outgoing with respect to Ponzi finance. Specifically, we distinguish incoming firms that *enter* the sample as Ponzi, from

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<sup>3</sup>In contrast, additive decompositions (e.g. shift share analyses or Oaxaca-Blinder decompositions) rely on the linearity of the weighted mean and, therefore, cannot be extended to decompositions of the median or other quantiles of interest.

those that *transition* from a more robust regime. Similarly, we distinguish between outgoing firms that *exit* the sample, and those that *transition* to a more robust regime. We implement this detailed decomposition using unconditional quantile regressions (Firpo, Fortin & Lemieux, 2009; Fortin, Lemieux & Firpo, 2011).

Our results demonstrate that observed trends in NFC balance sheet structure are driven by *compositional effects*, rather than by changes in the behavior of continuing firms, both in the full sample and for subsamples defined by Minskian measures of fragility. These compositional effects are, furthermore, particularly important (i.e. the largest in magnitude) for the most fragile (Ponzi) firms. Accordingly, these results indicate that changing patterns of entry and exit – i.e. ‘churning’ – are a primary mechanism through which new financial norms are realized in the post-1980 nonfinancial corporate sector. As such, an exclusive search for within-firm explanations will yield an incomplete picture of the causes and consequences of post-1980 changes in portfolio and financing behavior. Instead, the importance of entry and exit isolate an important link between the ‘financialization’ of nonfinancial corporations and changing dynamics of inter-firm competition. Finally, the quantile methods used in this paper allow us to explicitly account for firm-level heterogeneity in our decompositions; in doing so, we, also, speak to a theoretical literature emphasizing the importance of across-firm heterogeneity in analyses of the dynamics and evolution of the nonfinancial corporate sector over time (see Delli Gatti, Gallegati, Giulioni & Palestrini, 2003, for an example that incorporates firm-level heterogeneity via Minskian categories).

This paper is organized as follows. In Section 2 we introduce the data and key trends in firm cash holdings and financial obligations over the post-1980 period. In Section 3 we describe the two-step quantile decomposition method. Section 4 presents results of these decompositions, focusing first on the median, and then extending the analysis to a large range of quantiles. Section 5 concludes.

## 2 Describing the evolution of firms’ balance sheets

### 2.1 Data

In this section we introduce the main trends in firm cash holdings, debt, and total financial obligations that motivate the decompositions in Sections 3 and 4.<sup>4</sup> Our sample is drawn from Compustat. We include all firm-year observations for firms incorporated in the U.S. with non-negative recorded sales, assets or interest payments between 1970 and 2014, and exclude financial firms (SIC codes 6000-6799). To define transitions in and out of Minskian financing regimes for the detailed decomposition, we also eliminate firms with gaps

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<sup>4</sup>See Davis (2016) for a complete discussion of the changes in firm balance sheets over the post-1970 period.

(0.64% of the sample). Finally, we exclude observations that we cannot assign as hedge, speculative or Ponzi due to missing data. Our final sample includes 222,799 observations describing 20,587 firms.

Our analysis is based on three main variables. First, we analyze the evolution of cash (Compustat item #1), which we measure relative to sales (#12) to capture firm size.<sup>5</sup> Cash includes liquid short-term financial assets: cash and all short-term liquid securities readily transferable to cash, such as certificates of deposit, commercial paper, money-market funds, and marketable securities. Second, total debt is defined as the sum of debt in current liabilities (#34) and total long-term debt (#9). Third, total liabilities include total debt and non-debt financial obligations (accounts payable, #70; income taxes payable, #71; other current liabilities, #72; other liabilities, #75; and deferred taxes and investment tax credit, #35).<sup>6</sup> We normalize both measures of financial obligations by total assets (#6), to measure the share of these assets that are financed by debt (or other liabilities).

We follow the empirical application of Minskian regimes to Compustat data in Davis et al. (2017) to classify each firm-year observation as hedge, speculative or Ponzi. Doing so requires defining a firms' relevant sources of cash and obligatory financial commitments in each period. These sources of cash include liquid cash inflows net of expenses like wages and salaries (which have a prior claim on cash flow, relative to financial obligations), and exclusive of any new sources of cash (e.g. from new borrowing or equity issues). Financial commitments include required interest and principal payments due that year; thus, any discretionary uses of cash, including principal payments in excess of those due that year, are excluded. Following Minsky (1986) a firm is *hedge* if its sources of cash exceed both interest and principal obligations. A *speculative* firm has sufficient sources of cash to cover interest but not principal. Finally, *Ponzi* firms have insufficient sources of cash to cover either interest or principal, and must roll both into future debt. Details describing this empirical classification are summarized in the appendix (Table 7); see also Davis et al. (2017, pgs. 5-8).

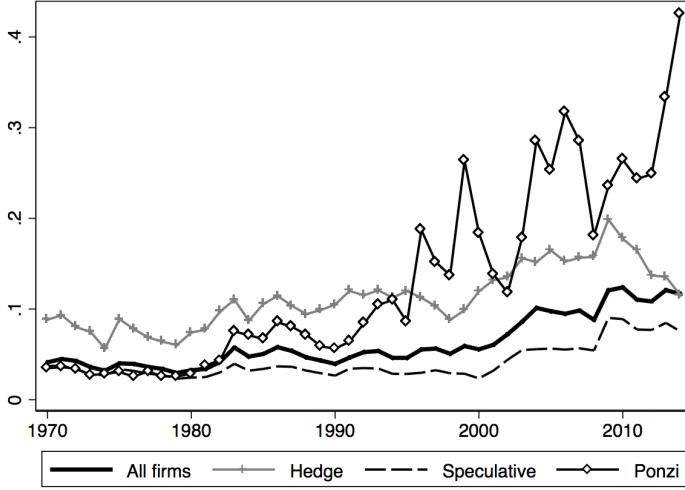
Based on these classifications, Davis et al. (2017) show that the share of Ponzi firms in the U.S. nonfinancial corporate sector increases from 10.8% to 31.6% of firms between 1970 and 2014, with the expansion in Ponzi finance primarily concentrated during the 1980s and 1990s. This increased incidence of Ponzi finance is concurrent with a declining share of speculative firms (from 72.3% to 45.3% of NFCs), whereas the share of firms with hedge structures is relatively stable. Davis et al. (2017), furthermore, show that the increase

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<sup>5</sup>We use sales, rather than total assets, to avoid composition effects on the asset side of the balance sheet wherein an increase in one asset category necessarily implies a fall in another asset category (relative to total assets). However, while these composition effects strongly impact the interpretation of trends in some asset categories (e.g. receivables fall after 1980 when measured relative to assets, but grow approximately proportionately with sales), cash and short-term investments is not strongly affected by the choice of normalization. Thus, both the descriptive time patterns and the decomposition results shown below are qualitatively robust to normalizing cash by total assets.

<sup>6</sup>This definition of total liabilities excludes minority interest (i.e. shares in consolidated subsidiaries not owned by the parent company), which we instead treat as equity.

Figure 1: Cash and short-term assets relative to sales (medians)  
All firms and by regime type; 1970-2014



*Notes:* The figure shows the across-firm yearly medians of cash and short-term investments, normalized by sales, for the full sample of NFCs, and by financing regime. For details describing the sample and for variable definitions, see Section 2.1.

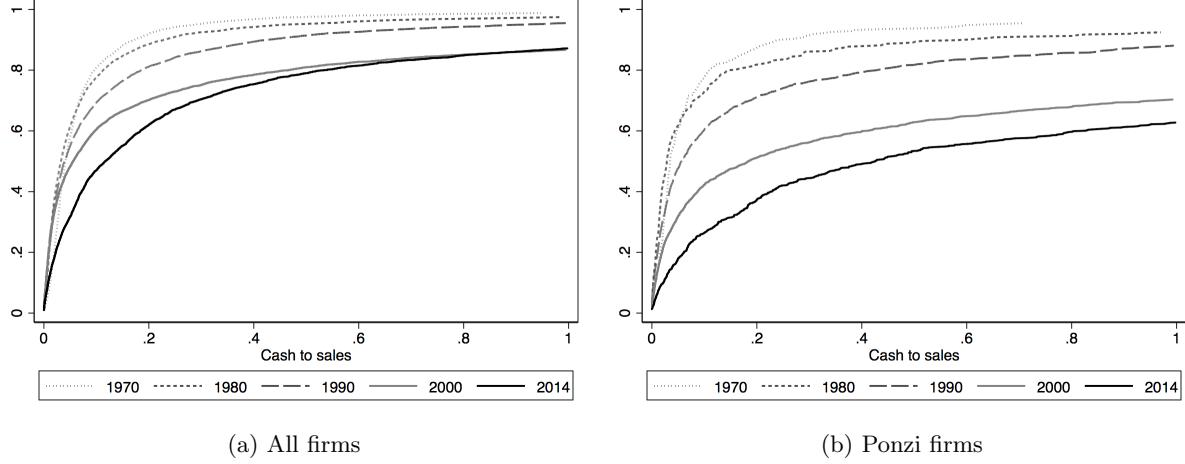
in Ponzi finance occurs across industries, such that it does not reflect the expansion of a financially fragile industry, and is primarily concentrated among small firms. In particular, by 2014 almost 70% of firms in the bottom quartile of the asset distribution are Ponzi and, thus, unable to meet either their interest or principal obligations with current income.

## 2.2 Cash and financial assets

Figure 1 plots the across-firm yearly medians of cash to sales for the full sample, and for subsamples of hedge, speculative and Ponzi firms. Across the full sample, shown by the solid black line in Figure 1, median cash holdings increase from 4.1% to 11.7% of sales between 1970 and 2014. In particular, this growth in cash holdings begins after 1980 and accelerates after 2000, approximately doubling (from 5.6% to 11.7%) between 2000 and 2014. Figure 1, also, shows that – while cash to sales rises in all three financing regimes – there is heterogeneity in the pattern of cash growth by regime. Hedge firms, first, hold relatively more cash than firms in other regimes over the full period, and their cash holdings also increase more gradually relative to other regimes.

Second, and most strikingly, growth in Ponzi firms' cash holdings dwarfs that of both the other regimes and the full sample. Specifically, Ponzi firms' cash to sales ratio increases from 3.5% to 46.2% between 1970 and 2014. Concurrently, hedge firms' median cash holdings rise from 8.8% to 11.5% of sales and those of

Figure 2: Estimated cumulative distribution functions (truncated at 1)

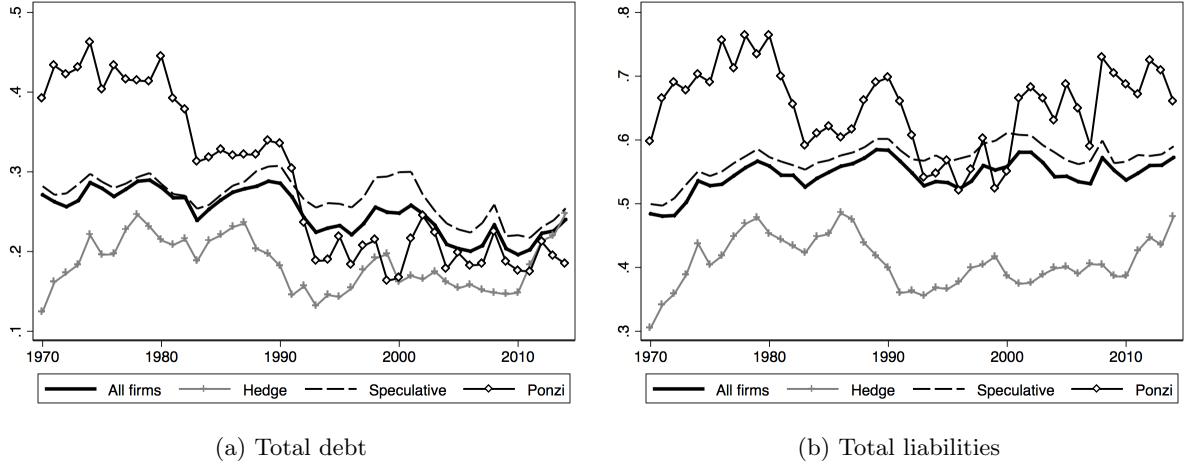


*Notes:* The figure shows the estimated cumulative distribution functions for the full sample of firms and Ponzi firms, respectively. The cumulative distribution functions are truncated at 1. For details describing the sample and for variable definitions, see Section 2.1.

speculative firms rise from 3.7% to 7.5%. Furthermore, despite both a close intersection between a firms' likelihood of being Ponzi and of being small (Davis et al., 2017), and the fact that small NFCs hold relatively large stocks of cash (Bates et al., 2009; Davis, 2016), Ponzi firms' cash growth substantially exceeds that of small firms. Specifically, between 1970 and 2014, the cash holdings of firms in the bottom quartile of assets increase from 4.4% to 22.2% of sales — an increase that exceeds that of the full sample, but is considerably less than among Ponzi firms. This growth in Ponzi firms' cash holdings is surprising: given that these firms cannot meet their financial commitments with current income, they would be expected to utilize available resources to meet financial obligations, rather than to accumulate cash.

Figure 2, which plots the estimated cumulative distribution functions (CDFs) of cash to sales by decade, furthermore, captures systematic shifts in the distribution of cash holdings across firms over time. First, Figure 2a, which plots the CDFs for all firms, captures a monotonic downward shift between 1970 and 2000 at all quantiles of the cash to sales distribution. Below approximately the 60th percentile, this downward shift continues after 2000. Figure 2a, therefore, reiterates the median full sample trend in Figure 1, but also highlights heterogeneity across the cash-to-sales distribution, wherein this downward shift is particularly pronounced at lower quantiles. Turning only to Ponzi firms, Figure 2b echoes the full sample pattern, but also highlights that this pattern is more dramatic among Ponzi firms.

Figure 3: Financial obligations relative to assets (medians)  
All firms and by regime type; 1970-2014



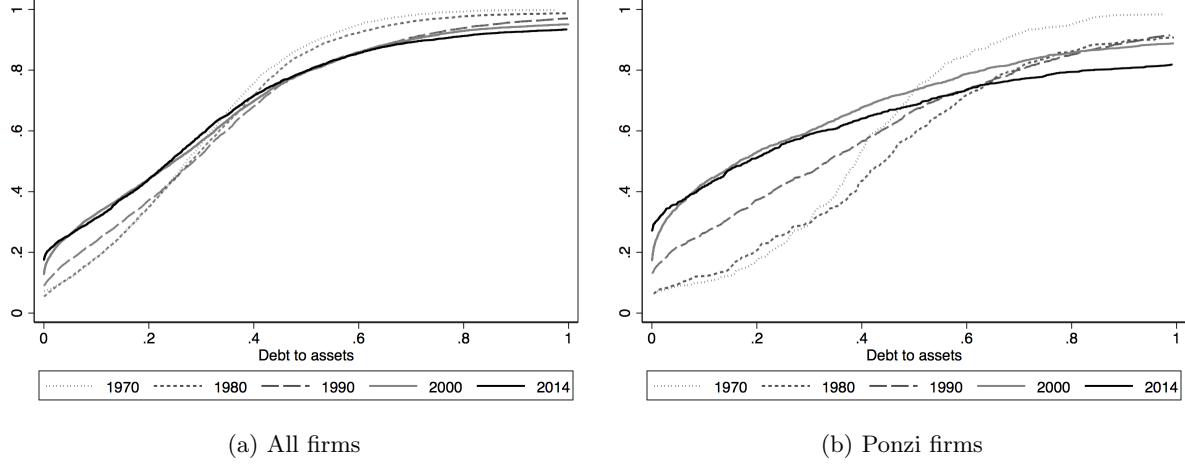
*Notes:* The figure shows the estimated cumulative distribution functions for the full sample of firms and Ponzi firms, respectively. The cumulative distribution functions are truncated at 1. For variable definitions, see Section 2.1.

### 2.3 Financial obligations

Turning to liabilities, Figures 3 and 4 plot the across-firm yearly medians of debt and total liabilities as shares of total assets for the full sample of firms, and by regime type. Recall that total debt is the sum of short-term (current) and long-term debt, whereas total liabilities also include non-debt obligations: accounts payable, income taxes payable, deferred taxes and investment tax credit, and other current and non-current liabilities. The full sample trends for debt and total liabilities shown by the solid black lines show, first, that total debt trends slightly downwards, from 27.1% of assets in 1970 to 24.0% by 2014, whereas total liabilities concurrently rise from 48.4% to 57.3% of assets. Notably, however, these full sample trends mask important heterogeneity in not only the magnitude, but also in the direction of change, by regime type and across the distributions of these variables over time.

First, note that Figure 3 highlights that the most financially robust (hedge) firms both hold less debt and have lower overall liabilities over the full period. In fact, through approximately 1990, the relationship between regime type and outstanding debt and liabilities is ‘ranked’ by the degree of financial fragility, where more financially fragile firms have more outstanding debt and more financial liabilities. However, Ponzi firms’ total debt as a share of assets declines dramatically – particularly during the 1980s and 1990s – from 44.4% in 1980 to 16.7% of assets in 2000. Notably, this decline in Ponzi firms’ outstanding debt coincides closely with the timing of the expansion in Ponzi finance during the 1980s and 1990s (Davis et al., 2017). Figure 3b, in turn, shows that – despite this decline in debt – Ponzi firms’ total liabilities as a share

Figure 4: Estimated cumulative distribution functions (truncated at 1)



*Notes:* The figure shows the estimated cumulative distribution functions for the full sample of firms and Ponzi firms, respectively. The cumulative distribution functions are truncated at 1. For variable definitions, see Section 2.1.

of assets are far more constant, such that debt falls as non-debt obligations (in particular, accounts payable and ‘other current liabilities’) rise. Nonetheless, the decline in debt is surprising: with insufficient current income to meet financial obligations, Ponzi firms should be net borrowers that accumulate debt over time.

Finally, Figure 4 describes the distribution of debt to assets, by decade, for all firms and Ponzi firms. The dominant pattern is an upward shift in the distribution between 1980 and 2000 until approximately the 60th percentile, such that firms below the 60th percentile become *less* indebted over the post-1970 period. Above the 60th percentile, however, the pattern flips, such that firms in these higher quantiles of the debt distribution become *more* indebted after 1970. The same pattern holds, but even more dramatically among Ponzi firms. Importantly, these patterns would be made invisible if we focus on weighted means for these groups. These CDFs, therefore, point to a key role for quantile decomposition-based methods, which allow for analysis across the full distribution.

### 3 A quantile decomposition method

The trends shown above, particularly for Ponzi firms, suggest that entry and exit — rather than within-firm behavioral changes over time — play an important role in the evolution of aggregate trends on firm balance sheets. Section 2, furthermore, highlights that the magnitudes — and, in the case of debt, also the direction — of shifts in the distributions of cash holdings and financial obligations over time vary across quantiles of these variables. Accordingly, standard decompositions of the (weighted) means of these variables are not

well-suited to analyzing these variations in firm balance sheets over time. This point is particularly important given that the substantial increase in the post-1980 incidence of Ponzi finance is concentrated among firms at lower quantiles of the asset distribution (Davis et al., 2017); small firms also tend to hold more cash and less debt over this period (see also Davis, 2016).

We, therefore, use quantile decomposition methods to analyze the role of churning in the nonfinancial corporate sector across the distributions of these variables, rather than only at the mean. We, first, analyze changes in the *medians* of cash holdings and financial obligations across firms (Sections 4.1 and 4.2); in Section 4.3 we extend the analysis to a large set of quantiles. We implement the decomposition in two steps. The first step uses a re-weighting method in the spirit of DiNardo et al. (1996) to compute counterfactual distributions to distinguish the contribution of changes within the set of *continuing* firms, from the contributions of changes in the composition of the sample (due to different financial structures among *incoming* and *outgoing* firms). In the second step, we focus primarily on Ponzi firms, and use unconditional quantile regressions (Firpo et al., 2009; Fortin et al., 2011) to distinguish the ways a firm can be incoming/outgoing with respect to Ponzi finance.

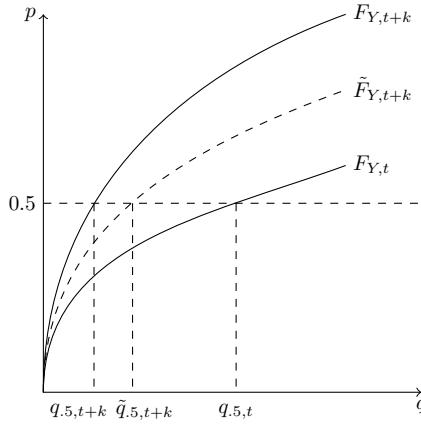
Specifically, we distinguish between incoming firms that enter the sample, versus those that transition from another financing regime; similarly, we distinguish between outgoing firms that exit the sample, versus that transition into another regime. Notably, both of these reasons for entry and exit are relevant for Ponzi firms. In particular, 17.7% of Ponzi firms IPO as Ponzi between 1970 and 2014, whereas 53.4% become Ponzi from a speculative regime (Davis et al., 2017). The relative share of Ponzi firms that IPO as Ponzi, also, increases over time as the incidence of Ponzi finance increases, to almost a quarter of Ponzi firms by 2014. Similarly, there are substantial probabilities of both exit and transition to more robust regimes following spells of Ponzi finance. Specifically, over the full post-1970 period, 30.2% of Ponzi firms exit after a spell of Ponzi finance, and 49.8% transition to a speculative regime.

Finally, for both steps of the decomposition, we conduct a set of ‘rolling decompositions’ between adjacent years. This choice of interval is key: as the two years over which the decomposition is performed become further apart, there are fewer continuing firms and more incoming/outgoing firms, such that – the longer the time interval – the more arbitrary the interpretation. If, for example, we choose a decade-long interval (e.g. 1900-2000), then a firm entering in 1991 and staying until 2000 (i.e. in the sample for all years but one) is classified as incoming—even though its behavior is conceptually closer to a continuing firm in the later years of the interval.

### 3.1 Step one: Continuing, incoming and outgoing firms

The first step decomposes changes over time in a quantile of each variable into the contribution of continuing firms, and the contribution of changes in the composition of the sample. Following DiNardo et al. (1996), we follow a re-weighting approach in which we construct a counterfactual (re-weighted) sample for one year of each time interval. Consider the illustration in Figure 5. Let  $F$  denote the unconditional cumulative distribution functions of a variable  $Y$  at times  $t$  and  $t+k$ . These functions are defined as  $F_{Y,t}(q) = \text{Prob}[Y \leq q]$ , such that the median at time  $t$ , for example, is defined as  $q_{0.5,t} = F_{Y,t}^{-1}(0.5)$ .

Figure 5: Illustration of the Decomposition Procedure



We, first, decompose the median change ( $q_{0.5,t} - q_{0.5,t+k}$ ) into the contribution of changes within the set of continuing firms, and the total contribution of incoming and outgoing firms. To do so we construct a counterfactual distribution for period  $t+k$  that holds the composition of firms between two years ( $t$  and  $t+k$ ) constant. Specifically, this counterfactual includes the observations of  $Y$  for continuing firms in  $t+k$  and for outgoing firms in  $t$  (while excluding all incoming firms in  $t+k$ ). Let  $\tilde{F}_{Y,t}$  denote this counterfactual distribution, and  $\tilde{q}_{0.5,t+k}$  the corresponding median. Given this counterfactual distribution, we can decompose the total change in the median between  $t$  and  $t+k$  into two components. The first component ( $\tilde{q}_{0.5,t+k} - q_{0.5,t}$ ) measures the contribution of changes in the distribution of  $Y$  between  $t$  and  $t+k$  within the set of continuing firms (the *within-firm effect*). The second component ( $q_{0.5,t+k} - \tilde{q}_{0.5,t+k}$ ) measures the contribution of changes in the composition of firms (the *composition effect*). Specifically, the compositional component emerges by replacing the distribution of  $Y$  across outgoing firms with the distribution of  $Y$  across incoming firms, while holding the distribution of continuing firms (observed in  $t+k$ ) constant. In other words, this decomposition

uses outgoing firms as the reference group against which the contribution of continuing firms is assessed.<sup>7</sup>

In turn, we use the same method to further decompose the compositional effect, in order to independently identify the contributions of incoming and outgoing firms. To do so, we construct a second counterfactual sample comprised only of continuing firms in the second period. Let  $\tilde{q}_{.5,t+k}^C$  denote the median of this sample. The overall composition effect can then be partitioned into two terms:

$$q_{.5,t+k} - \tilde{q}_{.5,t+k} = (q_{.5,t+k} - \tilde{q}_{.5,t+k}^C) + (\tilde{q}_{.5,t+k}^C - \tilde{q}_{.5,t+k}) \quad (1)$$

where the first term in parentheses is the contribution of incoming firms, and the second term is the contribution of outgoing firms, and each effect is assessed relative to the reference group of continuing firms.

For intuition, consider a hypothetical decomposition of the cash-sales ratio, in which both terms on the right-hand side in Equation (1) are positive. The first term gives the change in the median cash-to-sales ratio at  $t+k$  when incoming firms enter the sample, after outgoing firms have left. A positive value, therefore, implies that – relative to continuing firms in period  $t+k$  – incoming firms *raise* the observed median cash-sales ratio. In turn, the second term defines the change in the median value of the cash-sales ratio at time  $t+k$  when outgoing firms leave the sample, before they are replaced by incoming firms. A positive value implies that – relative to the firms that continue in  $t+k$  – outgoing firms would have contributed to lowering the median cash-sales ratio *had they stayed* in the sample with the same cash-sales ratio they had in period  $t$ . By instead leaving, these outgoing firms *raise* the median cash-sales ratio. In this hypothetical example, a positive composition effect is therefore produced by both incoming and outgoing firms.

### 3.2 Step two: The detailed decomposition

In the second step of the decomposition we turn, specifically, to Ponzi firms, to further decompose the contributions of incoming and outgoing firms into entry, exit, and regime transition. However, with more than one reason a firm may be incoming or outgoing, the re-weighting method above – which generates a path-dependent decomposition – has limited applicability. In particular, the results depend on the order the effects of each reason are computed, such that the resulting terms are not directly comparable.<sup>8</sup> To

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<sup>7</sup>This decomposition is not unique. We could, instead, compute a counterfactual distribution for period  $t$  (rather than  $t+k$ ) by replacing the observations for outgoing firms with those of incoming firms, and assess the contribution of continuing firms against the distribution of incoming firms. Our primary results implement the case in Figure 5, with outgoing firms as the reference group; however, the results are qualitatively robust to changing the reference group (shown in the appendix).

<sup>8</sup>This path dependence is a well-documented property of decompositions based on counterfactual samples (Fortin et al., 2011). To illustrate this path dependency in our context, consider the following decomposition of the effect of incoming firms into entry and transition components:

$$q_{.5,t+k} - \tilde{q}_{.5,t+k}^C = (q_{.5,t+k} - \tilde{q}_{.5,t+k}^{C,T}) + (\tilde{q}_{.5,t+k}^{C,T} - \tilde{q}_{.5,t+k}^C) \quad (2)$$

circumvent this path dependency, we implement the detailed decomposition using unconditional quantile (RIF) regressions, which estimate the impact of an independent variable on an unconditional quantile of a dependent variable (Firpo et al., 2009). These regressions allow us to estimate, for example, the individual effects of entry and regime transitions on the median, relative to the counterfactual sample of continuing firms in  $t + k$ . As such, we decompose the total effect of incoming firms into two terms with the same interpretation as in the aggregate decomposition above.

Specifically, we estimate the following two unconditional quantile regressions:

$$\begin{aligned} RIF(\tilde{Y}, \tilde{q}_{0.5,t+k}) &= \alpha_O + \beta_O O_{t+k}^X + \gamma_O O_{t+k}^T + \epsilon_{O,t+k} \\ RIF(Y, q_{0.5,t+k}) &= \alpha_I + \beta_I I_{t+k}^E + \gamma_I I_{t+k}^T + \epsilon_{E,t+k} \end{aligned} \quad (3)$$

where  $RIF(y, q_{0.5,t+k})$  is the recentered influence function of  $Y$  at the median of the distribution of  $Y$ . In turn,  $O_{t+k}^X$ ,  $O_{t+k}^T$ ,  $I_{t+k}^E$ , and  $I_{t+k}^T$  are dummy variables indicating the subsequent status of outgoing firms (exit or transition), and the prior status of incoming firms (entry or transition). The conditional expectation of  $RIF(y, q_{0.5,t+k})$  is the median of  $Y$ ; thus, estimating the equations in (3) using OLS estimates the effect of changes in the composition of each group on the medians  $\tilde{q}_{0.5,t+k}$  and  $q_{0.5,t+k}$ .

By doing so, we obtain the fitted values for the medians of each sample:

$$\begin{aligned} \hat{\tilde{q}}_{0.5,t+k} &= \hat{\alpha}_O + \hat{\beta}_O \bar{O}_{t+k}^X + \hat{\gamma}_O \bar{O}_{t+k}^T \\ \hat{q}_{0.5,t+k} &= \hat{\alpha}_I + \hat{\beta}_I \bar{I}_{t+k}^E + \hat{\gamma}_I \bar{I}_{t+k}^T \end{aligned} \quad (4)$$

where bars denote the sample means of the variables (i.e. the observed shares of exiting, entering, and transitioning firms). The constants are estimates of the median of  $Y$  for a counterfactual sample comprised only of the excluded group of continuing firms ( $\tilde{q}_{0.5,t+k}^C$ ), whereas the other two terms estimate the contributions of outgoing firms by subsequent status, and of incoming firms by prior status. For example, consider the contribution of incoming firms to the cash-to-sales ratio at time  $t + k$ . The individual effect of entry into the sector,  $\hat{\beta}_I \bar{I}_{t+k}^E$ , is the product of two terms: the estimated partial effect of increasing the number of firms entering the sample ( $\hat{\beta}_I$ ) and the observed share of firms entering the sample within the set of incoming and continuing firms at  $t + k$  ( $\bar{I}_{t+k}^E$ ). The contributions of outgoing firms by subsequent status ( $\hat{\beta}_O \bar{O}_{t+k}^X$  and

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where  $\tilde{q}_{0.5,t+k}^{C,T}$  is the median of a counterfactual sample that includes continuing ( $C$ ) and incoming firms that transitioned from other size or regime cells ( $T$ ). The first term on the right-hand side is the contribution of firms entering the sample; the second term is the contribution of firms transitioning from other financing regimes. Path dependency arises because each term represents a different comparison (the first term is assessed against continuing firms, and the second term is assessed against both continuing and transitioning firms), thereby complicating interpretation of the results. For example, a group may contribute positively to the median when assessed against continuing firms, but negatively when assessed against continuing firms and the other group. Furthermore, while one could in principle choose a common reference group, the resulting decomposition would not add up to the observed change it is meant to decompose.

$\hat{\gamma}_O \bar{O}_{t+k}^T$ ) are, in turn, reported with the opposite sign of the regression output, as these firms are leaving the sample (ensuring consistency with the interpretation of outgoing firms in Equation 1).

Note, finally, that – unlike the first step of the decomposition – the regression-based decomposition fits a linear model, such that it is subject to estimation error. In general, estimates of the median for the counterfactual sample of only continuing firms at time  $t + k$  ( $\hat{\alpha}_O$  and  $\hat{\alpha}_I$ ) will not be exactly equal to the actual sample median ( $\tilde{q}_{t+k}^C$ ). Thus, our detailed decompositions include unexplained residuals reflecting these estimation errors:

$$\begin{aligned}\tilde{q}_{.5,t+k}^C - \tilde{q}_{.5,t+k} &= -\hat{\beta}_O \bar{O}_{t+k}^X - \hat{\gamma}_O \bar{O}_{t+k}^T - e_O \\ q_{.5,t+k} - \tilde{q}_{.5,t+k}^C &= \hat{\beta}_I \bar{I}_{t+k}^E + \hat{\gamma}_I \bar{I}_{t+k}^T + e_I\end{aligned}\tag{5}$$

where  $e_O = \tilde{q}_{.5,t+k}^C - \hat{\alpha}_O$  and  $e_I = \tilde{q}_{.5,t+k}^C - \hat{\alpha}_I$ . Note that the magnitude of these residuals in our estimations are generally small and, more importantly, tend to move in the same direction as the estimated effects (such that they tend not to affect the direction of our results).

## 4 Results

We present our results in three parts. Following the descriptive discussion in Section 2, we begin with decompositions of the median. In Section 4.1, we decompose the cash-to-sales, debt-to-assets, and total-liabilities-to-assets ratios for the full sample of firms using the re-weighting method in Section 3.1. In Section 4.2 we turn to Minskian financing regimes. We present results of the first step of the decomposition for hedge, speculative and Ponzi firms and, using the second step of our methodology, we also present detailed decompositions for Ponzi firms. In Section 4.3, we extend the decompositions to a large set of quantiles, to highlight the robustness of our main conclusions to quantiles away from the median. In each case, we summarize our results by averaging results of the rolling decompositions over four sub-periods of the full sample.

Throughout this section we use outgoing firms as the reference group for the counterfactual sample. To explore the robustness of our results to the choice of reference group, however, Tables 10-13 in the appendix replicate the main decompositions using incoming firms as the reference. These tables show that our results are largely robust to changing the reference group, particularly for the aggregate decomposition that divides the within-firm effect from the total compositional effect.

Table 1: All Firms: Decomposing average annual changes in the median.

Cash as % of Sales					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.07	-0.12	0.05	0.07	-0.01
1982-1992	0.14	-0.19	0.33	0.33	-0.00
1993-2003	0.24	-0.05	0.29	0.35	-0.06
2004-2014	0.14	-0.02	0.16	0.26	-0.10
Debt as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.03	-0.24	0.21	0.06	0.14
1982-1992	-0.18	0.44	-0.62	-0.58	-0.04
1993-2003	-0.09	0.36	-0.45	-0.67	0.21
2004-2014	0.16	0.26	-0.10	-0.26	0.16
Liabilities as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	0.56	0.32	0.24	0.18	0.06
1982-1992	0.09	0.97	-0.88	-0.63	-0.25
1993-2003	0.18	0.78	-0.60	-0.32	-0.28
2004-2014	0.18	0.35	-0.17	0.12	-0.29

*Notes:* The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

## 4.1 The full sample

Table 1 describes the contributions of continuing, incoming and outgoing firms to median trends in cash to sales, debt to assets, and total liabilities to assets, for the full sample of firms. Table 1, first, reports the average annual change in the median of each ratio for each sub-period, and then disaggregates these average annual changes into the contribution of continuing firms (the within-firm effect), and a total compositional effect. Finally, the last two columns disaggregate the compositional effect into the independent contributions of incoming and outgoing firms.

Table 1 highlights most importantly that, for both cash and debt, the median trends described in Section 2 are produced by compositional effects, rather than behavioral changes occurring within firms over time. To begin, the top panel of Table 1 shows that the increase in the median cash-to-sales ratio since the 1980s is produced entirely by *incoming* firms. Specifically, incoming firms' contribution to median cash holdings relative to sales averages 0.31% per year after 1982 — more than enough to offset a negative within-firm effect, which concurrently averages -0.08% per year (while the effect of outgoing firms is close to zero). In

Table 2: Incoming firms that enter in each finance regime by subperiod  
Number and share of total

	<b>Total</b>	<b>Hedge</b>		<b>Speculative</b>		<b>Ponzi</b>	
		N	%	N	%	N	%
1971-1981	2854	777	27.2%	1647	57.7%	430	15.1%
1982-1992	3099	870	28.1%	1239	40.0%	990	31.9%
1993-2003	3173	528	16.6%	1205	38.0%	1440	45.4%
2004-2014	1370	242	17.7%	401	29.3%	727	53.1%
All Years	10496	2417	22.9%	4492	43.2%	3587	33.9%

*Notes:* The table shows the total number and share of incoming firms that enter the sample in each of the three financing regimes for each sub-period. For details describing the sample and for variable definitions, see Section 2.1.

other words, the median firm entering the nonfinancial corporate sector has higher cash holdings than the median incumbent firm, consistent with the fact that the IPO generates an inflow of funds to the firm that, at least initially, are held as cash (Bates et al., 2009). It is, accordingly, not surprising that the contribution of incoming firms is the largest during the 1980s and 1990s, which – as shown in Table 2 – was a period of high IPO activity.<sup>9</sup> In contrast, the negative within-firm contribution indicates that the median continuing firm has run down its cash holdings (relative to sales), such that — if we could ignore the effect of changes in the composition of firms, median cash holdings would have in fact fallen after 1980.

The second panel of Table 1 turns to debt. The declining median debt-to-asset ratio, which falls approximately 0.13% during 1982-2003, is again produced entirely by *incoming* firms. Specifically, relative to continuing firms in each year, incoming firms act to lower the median debt-to-asset ratio by an average of 0.62% per year. Incoming firms continue to bring down indebtedness in the final subperiod (2004-2014), a period when the overall median debt-to-asset ratio begins to rise. This result is intuitive: directly following the IPO, firms hold less debt than incumbent firms. In contrast, the median incumbent firm that continues in the sample from one year to the next consistently becomes more indebted, such that – throughout the post-1982 period – the average within-firm effect is positive, averaging 0.35% per year.

Note, finally, that outgoing firms contribute *positively* to the median debt-to-asset ratio in most subperiods, although not enough to offset the negative contribution of incoming firms. Thus, outgoing firms are relatively *less indebted* than continuing firms, such that – by leaving the sector – they increase the median debt-to-asset ratio. At first sight, this result is surprising, as it suggests that crushing debt obligations

<sup>9</sup>The number of public corporations rises during the 1980s and 1990s by almost 30% before declining to pre-1980 levels. The 1990s, in particular, are well-known as a period of high IPO activity (for a discussion see, for example Kahle & Stulz, 2017). In our sample, in particular, the number of distinct firms rises from 4784 in 1980 to 6136 in 2000, peaking in 1996 with 6689 firms. The number of firms subsequently declines, particularly after 2000, to 3979 in 2014. Note, finally, that in Table 2 the number of new entrants in the 1970s is driven upwards due to one big spike in 1975.

are not a determinant of exit from the corporate sector. This interpretation, however, must recognize two caveats. First, the dataset does not specify whether a firm exits the sector because it goes bankrupt, because it is acquired, or because it goes private. Second, the full-sample decompositions mask significant sub-group heterogeneity. Turning to Minskian financing regimes below helps to unpack the effect of exit, by showing that – among financially fragile firms – those that exit the sector are indeed more indebted than those that continue.

Finally, the third panel of Table 1 decomposes changes in the liability-to-asset ratio. The results mirror the two most consistent patterns observed for debt: continuing firms become more leveraged over time, while during the 1980s and 1990s incoming firms tend to be less leveraged than continuing firms. Unlike the case of debt, however, outgoing firms make negative contributions, suggesting that – while the median outgoing firm may not be more indebted than the median continuing firm – it is more leveraged. This result, accordingly, suggests a possibly important role for rising non-debt obligations as a correlate of exit. Furthermore, with total liabilities the positive within-firm effect is large enough to compensate for the combined negative effect of incoming and outgoing firms, such that the median liabilities to assets have not fallen after 1980.

Together, the decompositions in Table 1 highlight that, if we could ignore changes in the composition of the corporate sector, the trends described in Section 2.1 and 2.2 would have looked quite different: the median firm would have falling cash holdings, rising indebtedness, and rising leverage. However, these within-firm trends are countered by churning and, specifically, by the high rate of entry of new firms into the corporate sector during the 1980s and 1990s. These results, therefore, suggest that IPOs are a key mechanism through which changing financial practices are realized in the post-1980 nonfinancial corporate sector.

## 4.2 Minskian financing regimes

In Tables 3-6 we turn to subsamples of hedge, speculative and Ponzi firms. For each financing regime, we disaggregate the median changes in cash and outstanding liabilities into the contributions of continuing, incoming and outgoing firms. For Ponzi firms we, also, use the regression-based method described in Section 3.2 to distinguish the individual effects of entry into the sample, exit from the sample, and regime transitions.

We emphasize Ponzi firms for two main reasons. First, the rise of Ponzi finance may help explain why *entry* is the prime driver of the observed trends in cash holdings and indebtedness. As with the trends in cash holdings and indebtedness, the rise of Ponzi finance is also concentrated during the 1980s and 1990s, and – as described as Section 2 – the median Ponzi firm exhibits greater increases in cash to sales and decreases in debt to assets than the median firm in other regimes. Furthermore, as shown in Table 2, the share of firms

that *enter as Ponzi* increases substantially over this period, from 15.1% in 1971-1981 to a majority of new firms (53.1%) in 2004-2014. Concurrently, the shares of entering firms with hedge and speculative structures decline. Second, the median Ponzi firm has become less indebted and accumulated liquid financial assets, even though it is, by definition, unable to generate sufficient net operational income to meet its financial obligations. Our decomposition resolves this apparent puzzle: firms that continue over time as Ponzi *do* run down cash holdings and accumulate debt, while the overall median trends instead reflect changes in the composition of firms, with important roles for both entry and exit.

Table 3: Ponzi firms : Decomposing average annual changes in the median.

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.01	-0.10	0.10	0.19	0.18	0.05	-0.04	-0.08	0.08	-0.13	-0.03
1982-1992	0.19	-0.85	1.04	-0.21	0.86	-0.90	-0.17	1.25	0.29	0.50	0.46
1993-2003	0.23	-1.23	1.46	-2.97	1.10	-2.99	-1.09	4.44	0.76	2.19	1.48
2004-2014	0.58	-1.72	2.30	-2.28	0.82	-2.43	-0.67	4.58	1.26	1.99	1.33
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.04	1.86	-1.82	-5.88	-1.74	-3.87	-0.26	4.05	0.17	3.91	-0.02
1982-1992	-1.16	2.82	-3.98	-2.00	-2.73	1.05	-0.32	-1.98	-0.87	-0.85	-0.26
1993-2003	-0.23	1.88	-2.11	1.80	-0.97	2.60	0.17	-3.91	-0.93	-2.72	-0.26
2004-2014	0.10	1.35	-1.25	1.00	0.09	0.59	0.33	-2.25	-0.87	-1.03	-0.36
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	1.05	3.11	-2.05	-9.50	-1.75	-6.51	-1.25	7.45	0.08	6.58	0.79
1982-1992	-0.35	5.81	-6.17	-6.72	-3.28	-1.81	-1.63	0.55	-1.37	1.61	0.32
1993-2003	0.68	4.47	-3.79	0.71	-1.06	1.95	-0.18	-4.50	-1.95	-2.57	0.03
2004-2014	0.48	3.44	-2.95	0.16	1.09	-0.85	-0.09	-3.11	-2.68	-0.19	-0.24

*Notes:* The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

The top panel of Table 3 examines the cash-to-sales ratio among Ponzi firms. As with the full sector, the contribution of the within-firm effect to the change in the median ratio is negative, while the contribution of compositional changes is positive. Their combined effect yields an average increase in the median cash-to-sales ratio among Ponzi firms that, at least during the 1982-2003 period, was only moderately larger than that of the full sector: 0.21% per year versus 0.13% per year. These apparently similar trends, however, mask that the independent contributions of each component are much larger among Ponzi firms. After 1982, the within-firm effect for Ponzi firms, for example, averages -1.26% per year, versus -0.09% for the full sector. In other words, not only do firms decumulate cash between two consecutive years of being Ponzi, but they

do so at a much faster rate than firms in other financing regimes.

In turn, while the overall contribution of incoming Ponzi firms is negative, the detailed decomposition highlights that this overall effect is the product of a positive effect from firms that *enter the sector* and a (larger) negative effect of firms that *transition into* Ponzi from a more robust regime. The large and positive contribution of entry among Ponzi firms, averaging 0.92% per year after 1982, therefore corroborates the discussion above regarding the relationship between the IPO and cash holdings. Note, also, that — consistent with the calculations in Table 2 showing that the share of firms IPOing as Ponzi doubles between 1971-1981 and 1982-1992 — the positive contribution of entry among Ponzi firms increases substantially after 1982. In contrast, the total contribution of incoming firms is negative, indicating that firms transitioning from more robust regimes are likely to hold less cash than incumbent Ponzi firms. As shown by Davis et al. (2017), approximately 80% of firms that transition into Ponzi after 1970 do so from a speculative regime, such that they were reliant on current credit conditions to refinance debt. This result, therefore, suggests that increasingly fragile firms ‘wear down’ their stocks of cash as their financial positions deteriorate.

Like entering Ponzi firms, *outgoing* firms make a positive contribution to increasing median cash holdings – both when they transition into a more robust regime, and when they exit the sector entirely. Given that the within-firm effect is negative, and that the average duration of a spell of Ponzi finance exceeds one year, these results are intuitive: during a spell of Ponzi finance, firms wear down their stocks of cash such that when they leave Ponzi finance, regardless of the reason, their cash holdings are low. Note, specifically, that the average duration of a spell of Ponzi finance for a firm that then transitions into a speculative regime is 1.9 years, and that this duration is 2.8 years if the firm then exits the sector entirely. As such, by leaving the Ponzi firm subsample, outgoing firms – no matter the outcome – make large positive contributions to the median cash-to-sales ratio.

The main lessons from the analysis of trends in the median cash-to-sales ratio also apply to the median debt-to-asset and liability-to-asset ratios, particularly during the 1980s and 1990s, when the expansion of Ponzi finance is concentrated. The second and third panels of Table 2 show that within-firm effects are consistently positive, indicating that the median firm that continues as Ponzi between two years will hold more debt and more total liabilities relative to assets. As was the case with the speed at which Ponzi firms’ decumulate cash, the rate of accumulation of debt and liabilities by these Ponzi firms far exceeds that of firms under other financing regimes. Since 1982, the within-firm contribution to the change in the median debt-to-asset ratio averages 2% per year among Ponzi firms, as compared to 0.35% for the full sample. The within-firm contribution to the median liability-to-asset ratio, in turn, averages a remarkable 4.57% per year

among Ponzi firms, versus 0.7% among all firms. These numbers confirm the *a priori* expectation that Ponzi firms, which have to roll both interest and principal into future obligations in order to remain in the sample between two years, become more indebted and leveraged over time, and do so far more quickly than firms with more robust financing structures.

In contrast, the total compositional effect for both debt and total liabilities is negative, indicating that churning within the subsample of Ponzi firms has reduced the median debt-to-asset and liability-to-asset ratios. Between 1982 and 2003, this composition effect was furthermore large enough to offset the within-firm effect, thereby producing the sizable decline in the median Ponzi firms' outstanding debt (relative to assets) shown in Section 2.3. The detailed breakdown of the composition effect is again instructive. First, *entry* into the nonfinancial corporate sector acts to reduce both the median debt-to-asset and liability-to-asset ratios during the 1980s and 1990s. In other words, not only do entering Ponzi firms hold more cash than incumbent firms, but they also hold less debt and have lower overall leverage. Once again, the increase in IPOs in these decades, highlighted in Table 2, moderates the trend towards lower liquidity and lower solvency that follows from Ponzi finance.<sup>10</sup>

Second, *exit* from the sector also acts to reduce both the median debt-to-asset and liability-to-asset ratios throughout the post-1982 period. This result can be understood similarly to our previous discussion of the effects of exit on the median cash-to-sales ratio. Because firms that continue as Ponzi between two periods become increasingly indebted and leveraged, they tend to have higher debt and total liabilities when they exit as compared to the remaining Ponzi firms. This result, again, supports the intuitive narrative wherein Ponzi firms that exit the sample, perhaps because of bankruptcy, eventually find their rising debt load to be unsustainable. Third, with the debt-to-asset ratio, the negative contribution of exit is consistently reinforced by a negative contribution of transitions into other regimes, such that the total contribution of outgoing firms is negative throughout the post-1982 period.<sup>11</sup> This pattern may again reflect the mechanical effect of a spell of Ponzi finance, but it may also reflect that firms transitioning from Ponzi to more robust regimes have experienced an increase in net operational income relative to financial commitments – effectively making them creditworthy to the point of being able to borrow more than other Ponzi firms.<sup>12</sup>

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<sup>10</sup>In contrast, firms that transition into Ponzi from other regimes tend to increase median indebtedness and, during 1993-2003, median leverage. As a result, the total contribution of incoming firms to the overall medians oscillates between positive and negative depending on the relative strength of these two components.

<sup>11</sup>In the case of total leverage, the effect of regime transitions was positive between 1982-1992 but negative between 1993-2003, such that the total contribution of outgoing firms oscillates between positive and negative.

<sup>12</sup>Note that Davis et al. (2017) document that a high share of Ponzi firms are Ponzi due to negative sources of cash net of operational expenses – i.e. before even considering their financial obligations. Over the full period, 84.1% of Ponzi firms in our sample have negative sources of cash; the share of Ponzi firms with negative sources of cash that subsequently transition to a more robust regime is still high, but more than ten percentage points lower (71.8%).

Table 4: Ponzi firms: Decomposing average annual changes in the median Interest payments to sales

Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.20	0.25	-0.05	-0.83	-0.09	-0.58	-0.17	0.78	0.10	0.57	0.11
1982-1992	-0.18	0.12	-0.30	-0.50	-0.04	-0.40	-0.06	0.21	-0.04	0.25	0.00
1993-2003	-0.00	0.11	-0.11	-0.25	0.03	-0.24	-0.04	0.14	0.00	0.12	0.01
2004-2014	0.03	0.18	-0.15	-0.76	0.02	-0.45	-0.32	0.61	-0.01	0.36	0.25

*Notes:* The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Note, finally, that Table 4, which decomposes changes in median interest payments as a share of sales for Ponzi firms, corroborates the patterns above. As continuing Ponzi firms become more indebted over time, they also face a growing interest burden. Specifically, the positive within-firm contribution averages 0.14% per year since 1982. In turn, changes in the composition of Ponzi firms act to reduce the interest burden. The result is a mostly trendless median ratio of interest payments to sales since the 1990s.

Table 5: Hedge firms : Decomposing average annual changes in the median.

Cash as % of Sales						
Annual Change	Within Firm	Composition				
		Total	Incoming	Outgoing		
1971-1981	-0.10	-0.31	0.22	-0.45	0.67	
1982-1992	0.32	-0.03	0.35	0.02	0.34	
1993-2003	0.35	-0.28	0.62	-0.19	0.81	
2004-2014	-0.33	-0.12	-0.21	-0.58	0.37	
Debt as % of Assets						
Annual Change	Within Firm	Composition				
		Total	Incoming	Outgoing		
1971-1981	0.76	0.08	0.68	2.27	-1.59	
1982-1992	-0.47	0.60	-1.07	-0.25	-0.82	
1993-2003	0.17	1.15	-0.98	0.30	-1.28	
2004-2014	0.67	0.84	-0.17	-0.41	0.24	
Liabilities as % of Assets						
Annual Change	Within Firm	Composition				
		Total	Incoming	Outgoing		
1971-1981	1.26	0.51	0.75	3.15	-2.40	
1982-1992	-0.72	1.00	-1.72	0.42	-2.15	
1993-2003	0.23	0.93	-0.70	1.37	-2.08	
2004-2014	0.78	0.90	-0.12	0.57	-0.68	

*Notes:* The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Table 6: Speculative firms : Decomposing average annual changes in the median.

Cash as % of Sales					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.11	-0.07	-0.04	0.14	-0.18
1982-1992	0.09	-0.04	0.13	0.47	-0.35
1993-2003	0.18	0.10	0.08	0.49	-0.41
2004-2014	0.19	0.10	0.09	0.70	-0.61
Debt as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.09	-0.45	0.36	0.44	-0.08
1982-1992	-0.06	-0.09	0.03	-0.03	0.07
1993-2003	-0.13	-0.52	0.39	-0.63	1.02
2004-2014	0.03	-0.20	0.23	-0.35	0.59
Liabilities as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	0.60	0.09	0.51	0.10	0.41
1982-1992	0.03	-0.12	0.15	-0.50	0.65
1993-2003	0.19	-0.55	0.74	-0.73	1.47
2004-2014	-0.02	-0.49	0.47	-0.51	0.98

*Notes:* The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Finally, Tables 5 and 6 present the aggregate decomposition for hedge and speculative firms. We highlight only two key results regarding hedge and speculative firms. First, while within-firm and compositional effects for both hedge and speculative firms again generally pull the median ratios in opposite directions, the magnitudes of these effects are far smaller than among Ponzi firms. This result is particularly important for speculative firms, as it highlights that spells of speculative finance do not lead to spirals of falling liquidity and rising leverage. Second, like incoming Ponzi firms, incoming speculative firms make consistently positive contributions to the median cash-to-sales ratio, and consistently negative contributions to the debt- and liability-to-asset ratios. Furthermore, applying the detailed decomposition methodology to the subsample of speculative firms reiterates that *entry* into the corporate sector is again an important source of this effect.<sup>13</sup> As such, the role of IPOs in driving median cash-to-sales ratios extends beyond Ponzi finance, to also characterize the most common regime in the sector.

Together, the analysis of subsamples defined by Minskian regimes highlights that, as expected, spells of

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<sup>13</sup>For reference, we show detailed decompositions for hedge and speculative firms in the appendix.

Ponzi finance lead firms to decumulate cash and accumulate debt far more quickly than in other regimes. Among Ponzi firms, however, entry and exit play a fundamental role, preventing these within-firm trends from dominating the evolution of the balance sheets of the full sector. The effect of entry into the corporate sector is similar across financing regime: within a regime type, new firms tend to have more robust balance sheets than their incumbent counterparts. The fact that exit also contributes to more robust balance sheets is, however, unique to Ponzi firms, and captures that bankruptcy or changes in ownership limit how insolvent the Ponzi sector as a whole can become.<sup>14</sup> Our analysis of financing regimes, therefore, again highlights the key role of IPOs in the post-1980 evolution of balance sheet structures, but also points to a key role of exit in ‘checking’ the aggregate influence of unsustainable within-firm trends among Ponzi firms.

### 4.3 Moving beyond the median

The results in Section 4.1 and 4.2 show that, for the median firm, rising cash-to-sales and declining debt-to-assets ratio are produced by changes in the composition of firms, despite offsetting within-firm changes over time. The question remains, however, of whether this pattern holds at other quantiles of these variables’ distributions. In this section we, therefore, generalize the analysis above for a wide set of quantiles to explore the robustness of this main result across these distributions. To keep the analysis manageable, we focus on the cash-to-sales and debt-to-asset ratios; the aggregate decomposition that divides trends over time into within-firm and composition effects; and the full sample and Ponzi firms during the 1980s and 1990s (specifically, the 1982-1992 and 1993-2003 periods used above).<sup>15</sup>

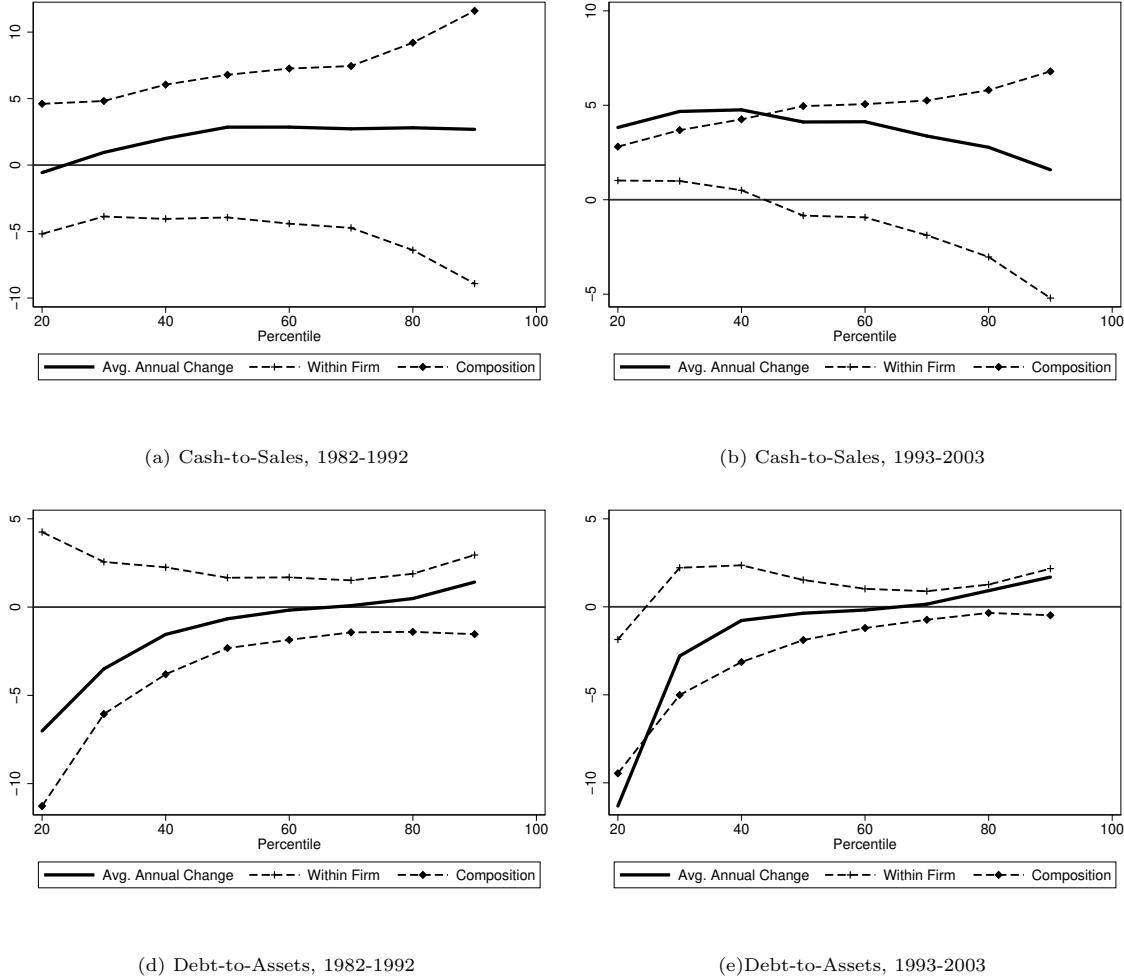
These results are summarized in Figures 6 and 7, which plot the average annual changes from the 20<sup>th</sup> quantile to the 90<sup>th</sup> quantile in increments of ten. To facilitate comparisons across quantiles, we divide the average annual changes by the average levels of the corresponding quantiles and report the results in percentages. For example, the data point for the 40<sup>th</sup> quantile of the cash-to-sales ratio for all firms was 2% during 1982-1992, implying that the average annual increase in cash-to-sales at the 40<sup>th</sup> quantile was equal to 2% of its average level from 1982-1992. In turn, notice that the solid lines in Figure 6, which show the changes in the distribution of the cash-to-sales and debt-to-asset ratios for all firms from 1982-1992 and from 1993-2003, are consistent with the trends described in Section 2. Specifically, the cash-to-sales ratio increases almost uniformly across the distribution, while the debt-to-asset ratio declines up until the 60<sup>th</sup>

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<sup>14</sup>There is a positive association between financial fragility (namely, being in a more fragile financing regime) and the likelihood of exit for the full sector. The analysis in Davis et al. (2017), for instance, indicates that being in a Ponzi regime enhances a firm’s likelihood of exit in the subsequent year, whereas being in a more robust regime reduces the likelihood of exit.

<sup>15</sup>While not reported in this section, decompositions for other measures and over the full set of periods analyzed above indicate that the qualitative results regarding the relative importance of compositional versus within-firm effects hold for a wide range of quantiles, and especially in the lower half of the distributions.

Figure 6: All firms: Decompositions across quantiles  
(As % of average levels per period)

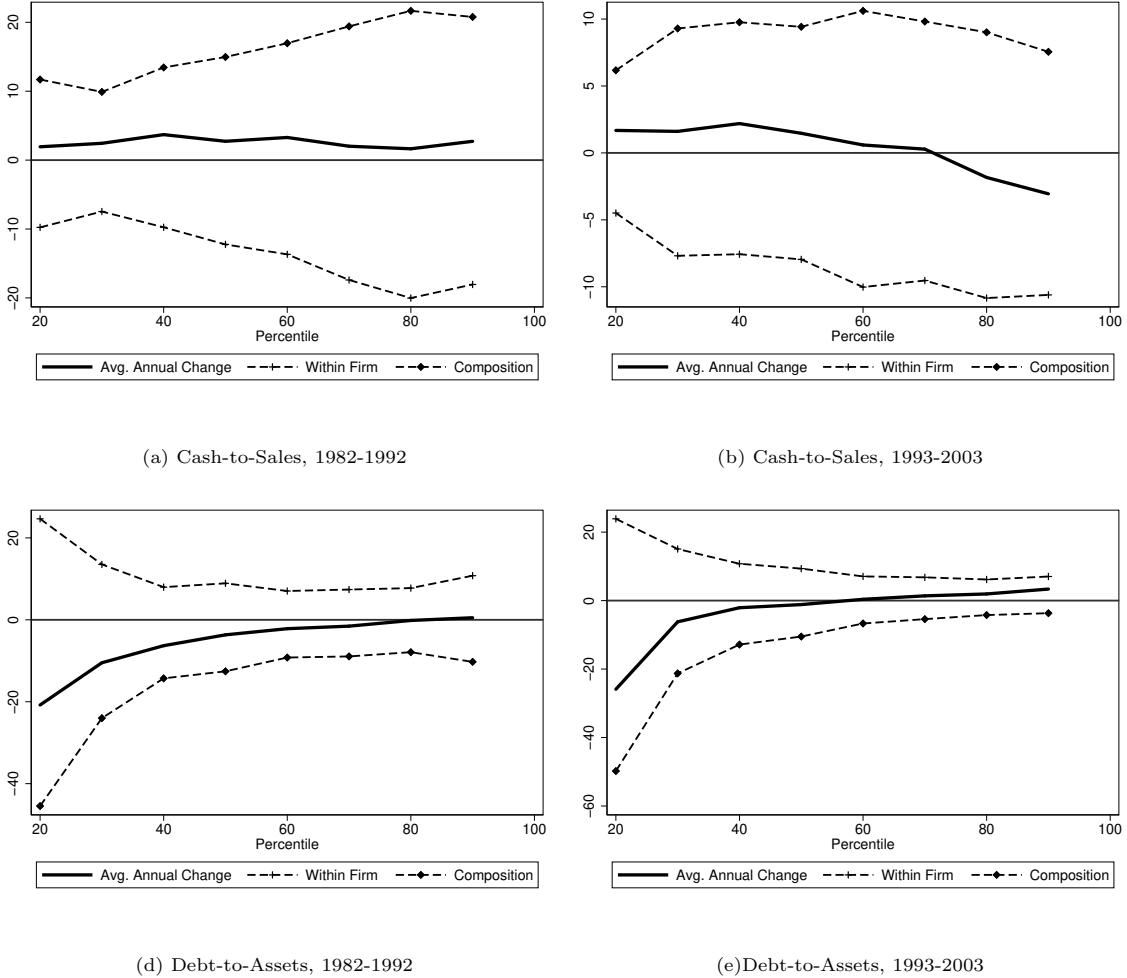


*Notes:* The figures plot the average annual change in selected quantiles of the cash-to-sales and debt-to-asset ratios, as well as their decomposition into within-firm and composition effects. The average annual changes are reported as percentages of the average levels of the quantiles over each period.

percentile. Note also that, in the case of the debt-to-asset ratio, Figure 6 indicates that the lowest quantiles display the steepest relative declines. This pattern reflects that the distribution of indebtedness is skewed, and, therefore, magnifies the effects of any absolute changes in these quantiles when assessed relative to their corresponding levels.<sup>16</sup> In turn, these decompositions across the distribution confirm our previous findings: during 1982-1993, the within-firm effect works to lower all quantiles of the cash-to-sales ratio and to raise all quantiles of the debt-to-asset ratio, while the composition effect works in the opposite direction. The same

<sup>16</sup>For example, from 1993-2003 the median debt-to-asset ratio averages 23.9% while the 20<sup>th</sup> quantile averages only 2.2%. This difference magnifies the relative impact of arguably similar absolute changes in these quantiles, which average -0.13 percentage points for the median and -0.25 percentage points for the 20<sup>th</sup> quantile.

Figure 7: Ponzi Firms: Decompositions across quantiles  
(As % of average levels in each period)



*Notes:* The figures plot the average annual change in selected quantiles of the cash-to-sales and debt-to-asset ratios, as well as their decomposition into within-firm and composition effects. The average annual changes are reported as percentages of the average levels of the quantiles over each period.

pattern holds during 1993-2003, with the exception that the within-firm effect also makes a slight positive contribution to raising the ratio of cash to sales up until the 40<sup>th</sup> quantile.

In turn, Figure 7 shows that the patterns among Ponzi firms are even more pronounced: the relative declines in the lowest quantiles of the debt-to-asset ratio are between two and four times larger than those in the full sample, as are the contributions of the within-firm and composition effects. Likewise, the negative within-firm contribution to the change in the cash-to-sales ratio is about twice as large as in the full sample, without any sign reversals in either period. In sum, the main conclusion from the analysis of the medians holds: across the distribution, the observed trends largely reflect changes in the composition of firms, rather

than within-firm changes over time.

## 5 Conclusion

The results in this paper highlight that churning in the nonfinancial corporate sector is a crucial determinant of post-1980 changes in the financial structure of U.S. nonfinancial corporations. First, for both the full sector and subsamples defined by Minskian financing regimes, the results point to changes in *entry* dynamics – and, specifically, increasing numbers of IPOs during the 1980s and 1990s – as a central mechanism through which changing financial norms are realized. As such, these results suggest that analyses of changes in IPO behavior, as well as the intersection with the increasing incidence of firms that IPO as Ponzi, are an important focus for further research on the evolution of firm financial structure. Second, we find that, among Ponzi firms in particular, exit is also a key mechanism that ‘checks’ the aggregate impact of unsustainable financing patterns among Ponzi firms. Third, and in notable contrast, the behavior of continuing firms tends to move in the opposite direction of the aggregate trends, highlighting that an exclusive focus on within-firm behavioral changes will yield an incomplete picture of the causes and consequences of post-1980 changes in firm financial structure. Instead, the dynamics of entry and exit, as well as links between changing entry/exit dynamics and inter-firm competition, come center stage.

The analysis in this paper also provides particular insight into the evolution of the most fragile subset of Ponzi firms in the U.S. economy. The post-1980 period has seen a sustained expansion in the incidence of Ponzi finance, and a concurrent increase in the share of firms that go public as Ponzi. Even though Ponzi firms are, by definition, unable to meet their financial commitments with current income, aggregate trends indicate that Ponzi firms are net acquirers of cash and become less indebted over time. Importantly, our results show that these trends are produced entirely by entry and exit, whereas firms that continue as Ponzi decumulate cash and become increasingly leveraged. Thus, Ponzi structures *are* in fact unsustainable: firms become Ponzi with relatively more robust financing structures, but further run down liquid financial assets and become increasingly indebted over time. Exit among Ponzi firms is, in turn, a key mechanism preventing unsustainable within-firm trends from acquiring substantial aggregate influence; furthermore, this role of exit has become increasingly important over time. Importantly, speculative firms – which tend to be large and well-established – also become more indebted and decumulate cash over time, but do not ‘spiral’ out of control.

These results speak to various strands of the literature, and also highlight directions for future research.

Most importantly, these results call for particular emphasis on changing dynamics of entry and exit. This focus on entry/exit has links, for example, to the strands of the existing literature that emphasize changes in firm characteristics over recent decades. In their analysis of cash holdings, for example, Bates et al. (2009) not only emphasize growing idiosyncratic risk as a determinant of corporate cash growth, but also link cash holdings to firm characteristics, showing that firms with more cash hold fewer inventories and receivables, and are more R&D intensive. Changing firm characteristics could reflect within-firm behavioral changes over time, but may also be indicative of exit and entry. Our results suggest a role for the latter and, more broadly, raise an important set of questions regarding links between a wide set of important and well-documented changes in firm characteristics – from declining fixed investment rates, to growth in intangibles – and changing patterns of inter-firm competition.

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## A Additional tables

Table 7: Empirical definitions of financing regimes  
 Reproduced from Davis, de Souza and Hernandez (2017)

	Compustat #
<b>Sources of funds</b>	
<i>Funds from operations</i>	
Income before extraordinary items <sup>1</sup>	18 + 15
Depreciation and amortization	14
Extraordinary items and discontinued operations	48
Deferred taxes <sup>2</sup>	126
Equity in net loss <sup>2</sup>	106
Sale of property, plant and equipment, and sale of investments (loss) <sup>2</sup>	213
Funds from operations - other <sup>2</sup>	217
<i>Funds from investment activities</i>	
Sale of property, plant and equipment <sup>2</sup>	107
Sale of investments <sup>2</sup>	109
<i>Other funds from current activities<sup>2</sup></i>	<u>218</u>
<b>Cash commitments</b>	
<i>Interest and Related Expenses</i>	15
<i>Debt in current liabilities – Total<sup>3</sup></i>	34
Notes payable	
Long-term debt due in one year	
<i>Trade accounts payable<sup>3</sup></i>	70
<i>Current liabilities - other<sup>3</sup></i>	72

*Notes:* <sup>1</sup> Income before extraordinary items is reported net of interest expense; we, therefore, add interest payments back into this income category to measure sources of cash available to meet financial obligations. <sup>2</sup> Items with zeros imputed for missing observations. <sup>3</sup> Items evaluated at the end of the previous year.

Table 8: Hedge firms: Detailed decompositions of the median

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.10	-0.31	0.22	-0.45	0.03	-0.52	0.03	0.67	-0.08	0.79	-0.04
1982-1992	0.32	-0.03	0.35	0.02	0.50	-0.47	-0.01	0.34	-0.09	0.40	0.03
1993-2003	0.35	-0.28	0.62	-0.19	0.29	-0.45	-0.04	0.81	-0.16	0.85	0.12
2004-2014	-0.33	-0.12	-0.21	-0.58	-0.11	-0.47	0.00	0.37	-0.30	0.61	0.07
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.76	0.08	0.68	2.27	0.18	2.30	-0.21	-1.59	0.38	-2.09	0.12
1982-1992	-0.47	0.60	-1.07	-0.25	-0.80	0.61	-0.05	-0.82	0.28	-1.13	0.03
1993-2003	0.17	1.15	-0.98	0.30	-0.41	0.57	0.14	-1.28	0.56	-1.67	-0.17
2004-2014	0.67	0.84	-0.17	-0.41	-0.59	0.23	-0.05	0.24	0.79	-0.61	0.05
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	1.26	0.51	0.75	3.15	0.36	2.79	0.01	-2.40	0.32	-2.56	-0.16
1982-1992	-0.72	1.00	-1.72	0.42	-0.96	1.33	0.05	-2.15	0.19	-1.94	-0.40
1993-2003	0.23	0.93	-0.70	1.37	-0.11	1.49	0.00	-2.08	0.30	-2.28	-0.09
2004-2014	0.78	0.90	-0.12	0.57	-0.34	1.10	-0.19	-0.68	0.63	-1.43	0.12
Interest payments as a % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.14	0.02	0.12	0.13	0.02	0.12	-0.00	-0.02	0.03	-0.04	-0.01
1982-1992	-0.09	-0.02	-0.06	-0.01	-0.06	0.05	-0.00	-0.05	0.01	-0.06	-0.00
1993-2003	-0.02	0.01	-0.02	0.08	-0.02	0.07	0.03	-0.11	0.02	-0.10	-0.03
2004-2014	0.05	0.01	0.04	-0.03	-0.02	0.01	-0.02	0.06	0.04	-0.01	0.03

Notes: The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Table 9: Speculative firms: Detailed decompositions of the median

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.11	-0.07	-0.04	0.14	0.03	0.12	-0.01	-0.18	-0.01	-0.18	0.01
1982-1992	0.09	-0.04	0.13	0.47	0.12	0.35	0.01	-0.35	-0.02	-0.33	0.01
1993-2003	0.18	0.10	0.08	0.49	0.09	0.41	-0.01	-0.41	-0.06	-0.37	0.02
2004-2014	0.19	0.10	0.09	0.70	0.08	0.63	-0.01	-0.61	-0.09	-0.53	0.02
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.09	-0.45	0.36	0.44	0.15	0.35	-0.06	-0.08	0.11	-0.20	0.00
1982-1992	-0.06	-0.09	0.03	-0.03	-0.18	0.09	0.06	0.07	0.03	0.10	-0.06
1993-2003	-0.13	-0.52	0.39	-0.63	-0.23	-0.43	0.03	1.02	0.19	0.88	-0.04
2004-2014	0.03	-0.20	0.23	-0.35	-0.05	-0.33	0.02	0.59	0.11	0.60	-0.12
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.60	0.09	0.51	0.10	0.20	-0.05	-0.04	0.41	0.11	0.35	-0.05
1982-1992	0.03	-0.12	0.15	-0.50	-0.23	-0.32	0.04	0.65	-0.06	0.74	-0.03
1993-2003	0.19	-0.55	0.74	-0.73	-0.11	-0.69	0.07	1.47	0.09	1.50	-0.12
2004-2014	-0.02	-0.49	0.47	-0.51	0.10	-0.64	0.03	0.98	-0.00	0.97	0.01
Interest payments as a % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.08	0.03	0.04	0.07	0.02	0.06	-0.01	-0.03	0.01	-0.04	0.00
1982-1992	-0.05	-0.07	0.02	0.12	0.01	0.12	-0.01	-0.10	-0.01	-0.09	0.01
1993-2003	-0.03	-0.06	0.03	0.05	0.00	0.05	-0.00	-0.02	0.00	-0.02	-0.00
2004-2014	-0.02	-0.04	0.02	0.04	0.00	0.04	-0.00	-0.02	-0.00	-0.02	0.00

Notes: The reference group for the counterfactual sample is outgoing firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

## B Changing the reference group, incoming firms

Table 10: All Firms: Median decompositions with incoming firms as reference

Cash as % of Sales					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.07	-0.12	0.05	0.06	-0.01
1982-1992	0.14	-0.17	0.31	0.30	0.01
1993-2003	0.24	-0.04	0.27	0.34	-0.07
2004-2014	0.14	-0.01	0.15	0.24	-0.09
Debt as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	-0.03	-0.26	0.22	0.09	0.13
1982-1992	-0.18	0.46	-0.64	-0.55	-0.08
1993-2003	-0.09	0.42	-0.51	-0.65	0.14
2004-2014	0.16	0.33	-0.17	-0.29	0.12
Liabilities as % of Assets					
	Annual	Within	Composition		
	Change	Firm	Total	Incoming	Outgoing
1971-1981	0.56	0.36	0.20	0.12	0.08
1982-1992	0.09	0.99	-0.90	-0.55	-0.36
1993-2003	0.18	0.75	-0.57	-0.31	-0.26
2004-2014	0.18	0.37	-0.20	0.20	-0.39

*Notes:* The reference group for the counterfactual sample is incoming firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Table 11: Ponzi firms: Median decompositions with incoming firms as reference

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.01	-0.12	0.12	-0.06	0.16	-0.15	-0.07	0.18	0.11	0.03	0.04
1982-1992	0.19	-1.06	1.25	-1.85	0.79	-1.91	-0.74	3.11	0.57	1.14	1.39
1993-2003	0.23	-1.34	1.56	-5.62	0.95	-4.09	-2.47	7.18	1.15	2.92	3.12
2004-2014	0.58	-1.78	2.36	-3.72	0.51	-3.34	-0.89	6.08	1.78	2.64	1.65
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.04	1.63	-1.59	-1.09	-0.79	-0.41	0.12	-0.50	-0.62	0.45	-0.33
1982-1992	-1.16	2.15	-3.31	1.51	-1.68	3.26	-0.06	-4.82	-1.69	-3.17	0.03
1993-2003	-0.23	1.74	-1.98	2.54	-0.55	3.10	-0.01	-4.51	-1.28	-3.32	0.08
2004-2014	0.10	1.44	-1.34	1.48	0.28	0.88	0.32	-2.82	-0.99	-1.21	-0.61
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	1.05	2.97	-1.92	-1.49	-0.04	-0.53	-0.92	-0.43	-0.95	0.35	0.17
1982-1992	-0.35	4.39	-4.75	1.08	-1.70	2.82	-0.04	-5.83	-2.88	-2.92	-0.02
1993-2003	0.68	3.98	-3.30	3.61	-0.17	4.06	-0.27	-6.91	-3.01	-4.50	0.60
2004-2014	0.48	3.80	-3.32	2.19	1.51	0.67	0.01	-5.51	-3.61	-1.40	-0.51
Interest payments as a % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.20	0.18	0.02	-0.28	0.02	-0.17	-0.13	0.30	-0.00	0.19	0.11
1982-1992	-0.18	0.08	-0.26	-0.33	-0.01	-0.31	-0.01	0.07	-0.08	0.14	0.01
1993-2003	-0.00	0.11	-0.12	-0.13	0.06	-0.18	-0.01	0.01	-0.03	0.05	-0.01
2004-2014	0.03	0.17	-0.14	-0.50	0.05	-0.36	-0.18	0.36	-0.04	0.28	0.13

Notes: The reference group for the counterfactual sample is incoming firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Table 12: Speculative firms: Median decompositions with incoming firms as reference

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.11	-0.08	-0.03	0.14	0.04	0.10	-0.01	-0.17	-0.01	-0.17	0.01
1982-1992	0.09	-0.01	0.10	0.45	0.11	0.35	-0.00	-0.36	-0.02	-0.34	-0.00
1993-2003	0.18	0.13	0.05	0.51	0.10	0.41	0.00	-0.46	-0.06	-0.38	-0.01
2004-2014	0.19	0.12	0.07	0.70	0.09	0.63	-0.02	-0.64	-0.10	-0.55	0.01
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.09	-0.42	0.33	0.35	0.10	0.29	-0.04	-0.02	0.13	-0.13	-0.01
1982-1992	-0.06	-0.03	-0.03	-0.09	-0.19	0.08	0.02	0.06	0.00	0.08	-0.02
1993-2003	-0.13	-0.51	0.38	-0.73	-0.26	-0.55	0.09	1.11	0.22	0.98	-0.10
2004-2014	0.03	-0.25	0.28	-0.42	-0.07	-0.40	0.06	0.70	0.13	0.64	-0.07
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.60	0.03	0.57	0.14	0.19	-0.04	-0.01	0.43	0.10	0.35	-0.02
1982-1992	0.03	-0.07	0.10	-0.51	-0.24	-0.34	0.07	0.61	-0.07	0.74	-0.06
1993-2003	0.19	-0.46	0.65	-0.90	-0.17	-0.81	0.08	1.55	0.11	1.58	-0.13
2004-2014	-0.02	-0.42	0.40	-0.66	0.07	-0.75	0.02	1.07	0.02	1.11	-0.06
Interest payments as a % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.08	0.05	0.03	0.07	0.01	0.07	-0.01	-0.04	0.01	-0.05	0.00
1982-1992	-0.05	-0.06	0.01	0.10	0.00	0.11	-0.02	-0.08	-0.01	-0.08	0.00
1993-2003	-0.03	-0.06	0.03	0.03	-0.00	0.04	-0.01	-0.00	0.01	-0.01	-0.00
2004-2014	-0.02	-0.04	0.02	0.03	0.00	0.03	-0.00	-0.01	-0.00	-0.01	0.00

Notes: The reference group for the counterfactual sample is incoming firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.

Table 13: Hedge firms: Median decompositions with incoming firms as reference

Cash as % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	-0.10	-0.25	0.15	-0.64	0.01	-0.61	-0.04	0.79	-0.06	0.84	0.02
1982-1992	0.32	-0.01	0.33	0.03	0.49	-0.43	-0.02	0.30	-0.08	0.43	-0.05
1993-2003	0.35	-0.32	0.67	-0.42	0.24	-0.65	-0.02	1.10	-0.12	1.02	0.19
2004-2014	-0.33	-0.02	-0.31	-0.71	-0.09	-0.46	-0.16	0.41	-0.29	0.52	0.18
Debt as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.76	0.18	0.58	2.46	0.19	2.36	-0.09	-1.88	0.38	-2.15	-0.11
1982-1992	-0.47	0.76	-1.23	0.16	-0.70	0.89	-0.03	-1.39	0.16	-1.51	-0.03
1993-2003	0.17	1.18	-1.01	0.83	-0.24	1.09	-0.02	-1.83	0.37	-2.23	0.03
2004-2014	0.67	0.74	-0.07	-0.02	-0.53	0.54	-0.03	-0.05	0.69	-0.80	0.06
Total liabilities as a % of Assets											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	1.26	0.39	0.88	3.57	0.38	3.00	0.19	-2.69	0.31	-2.75	-0.25
1982-1992	-0.72	0.97	-1.69	1.08	-0.78	1.74	0.11	-2.77	0.08	-2.51	-0.35
1993-2003	0.23	0.97	-0.74	1.95	0.02	1.97	-0.04	-2.69	0.15	-2.82	-0.02
2004-2014	0.78	0.92	-0.14	1.04	-0.26	1.32	-0.02	-1.18	0.59	-1.75	-0.02
Interest payments as a % of Sales											
Annual Change	Within Firm	Composition	Incoming Firms				Outgoing Firms				Resid.
			Total	Entry	Transition	Resid.	Total	Exit	Transition	Resid.	
1971-1981	0.14	0.02	0.12	0.15	0.02	0.12	0.00	-0.03	0.03	-0.05	-0.01
1982-1992	-0.09	-0.00	-0.08	-0.04	-0.06	0.04	-0.01	-0.05	0.02	-0.06	-0.01
1993-2003	-0.02	0.02	-0.04	0.06	-0.01	0.07	0.00	-0.10	0.01	-0.10	-0.02
2004-2014	0.05	0.01	0.04	-0.03	-0.02	0.01	-0.02	0.06	0.04	-0.01	0.03

Notes: The reference group for the counterfactual sample is incoming firms. The first column measures the average annual change in the variable of interest. Cash is measured relative to sales. Debt and total liabilities are measured relative to total assets. For details describing the sample and for variable definitions, see Section 2.1.