The Role of Human Capital in Corporate Bankruptcy

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Abstract

Using a sample of 1,493 public firms that filed for Chapter 11 between 1980 and 2003, I examine how the process of corporate bankruptcy varies by human capital intensity. I document two key patterns. First, human-capital-intensive firms increase their leverage more sharply prior to bankruptcy compared with low-human-capital firms, using borrowing to finance firm growth instead of undertaking typical restructuring activities. In conjunction with their increased borrowing, human-capital-intensive firms postpone bankruptcy longer after initial cashflow shortfalls, but file more quickly after suffering shocks to fundamentals. Second, human-capital-intensive firms are more likely to be liquidated within bankruptcy and perform better conditional upon emergence. Thus, concerns that Chapter 11 allows too many inefficient firms to emerge may be less applicable to human-capital-intensive firms.

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1 Introduction

Bankruptcy and the resolution of financial distress have long been central topics in corporate finance (Altman [1968]), and a substantial empirical literature has documented the path of financial distress for firms that file for Chapter 11.[1] A number of researchers have recognized that the nature of a firm's assets plays an important role in its experience of distress (Shleifer and Vishny [1992], Pulvino [1999], Acharya et al. [2007]). Despite the growing importance of human capital for firms in the economy, however, there has been little empirical work addressing its specific role in the bankruptcy process.[2] The inalienability of human capital may be especially salient in the context of bankruptcy, when the relationships between firms and their employees become threatened. Indeed, bankrupt firms routinely cite employee retention as a critical concern,[3] and human-capital-intensive firms may be particularly vulnerable to employee flight.

In this study, I establish a set of basic stylized facts on how firm behavior before, during, and upon emergence from Chapter 11 varies with human capital intensity. I highlight two key patterns. First, human-capital-intensive firms increase their leverage more sharply prior to bankruptcy, using borrowing to finance continued firm growth. Borrowing seems to allow human-capital-intensive firms to postpone bankruptcy longer following initial cashflow shortfalls. However, their reliance on credit may hinder the ability of human-capital-intensive firms to respond to shocks to fundamentals. Indeed, I find that these firms file for bankruptcy more quickly following low stock returns and industry distress. A second important finding is that human-capital-intensive firms experience a more stringent selection process within bankruptcy. They are more likely to be liquidated within bankruptcy and perform better conditional upon emergence. These findings have implications for both the capital structure decisions of human-capital-intensive firms and the effectiveness of asset reallocation in bankruptcy, and I discuss two potential interpretations below.

In the absence of firm-level data on human capital, I follow the labor economics literature in using the Current Population Survey (CPS) to measure human capital intensity. My main measure is the share of college-educated workers in each industry (college share).[4] Although college share seems to capture an intuitive notion of human capital intensity (see Table 3), the results are consistent when using a variety of specifications and alternative human capital measures. Furthermore, the results do not seem to be driven by the differential selection of human-capital-intensive firms *into* bankruptcy.

I examine the process of bankruptcy for a sample of 1493 Chapter 11 filings by publicly listed firms between 1980 and 2003. I find that human-capital-intensive firms are more aggressive in their

[1] Asquith et al. [1994] examine firms' responses to distress prior to entering bankruptcy, which often include asset sales, debt restructuring, and cuts in capital expenditure. Gilson et al. [1990] compare successful out-of-court restructurings and bankruptcy filings. Kalay et al. [2007], Denis and Rodgers [2007], and Lemmon et al. [2009] consider the determinants of firm outcomes within bankruptcy, and Hotchkiss [1995] and Lemmon et al. [2009] document post-bankruptcy performance.

[2] Berk et al. [2007] and Berkovitch et al. [1997] are notable theoretical papers which relate human capital and bankruptcy.

[3] Firms often submit motions during the first day of bankruptcy proceedings appealing the court to authorize timely payment of wages outstanding at the time of filing, which would otherwise remain unpaid until the conclusion of the Chapter 11 case. As a typical example, a motion filed in the case of The Grand Union Company in 2000 asserted that "unless the relief requested herein is granted, the employees may leave the employ of the debtors in vast numbers, crippling Grand Union's operations and depriving the debtors of the opportunity to sell assets or reorganize."

[4] See Section 3 for details on variable construction.

growth during the ten years prior to bankruptcy as measured by changes in total assets, investment, and employment. Instead, their pre-bankruptcy growth is largely financed by increased borrowing. While the previous literature has emphasized restructuring activities such as selling assets and reducing investment that firms undertake in response to financial distress (Asquith et al. [1994], Brown et al. [1994]), my findings suggest that human-capital-intensive firms are less likely to take measures that reduce firm scale. Furthermore, since private lenders are more likely to loosen credit to distressed firms as documented by Asquith et al. [1994], human-capital-intensive firms may find it beneficial to raise debt privately ex ante in order to obtain flexible credit during times of distress.

Their greater reliance on borrowing may also account for patterns in the timing of bankruptcy observed for human-capital-intensive firms. In particular, I examine the length of time firms are able to postpone bankruptcy after the initial onset of distress, which is measured in three different ways. Human-capital-intensive firms persist for a longer period with low interest coverage before they file for bankruptcy, but file more quickly following low stock returns and industry distress. The timing results may be related to the initial loosening and later tightening of credit to distressed firms documented by Asquith et al. [1994].[5] In particular, human-capital-intensive firms may benefit from credit loosening following cashflow shortfalls, but their reliance on borrowing may make them vulnerable to credit tightening after shocks to fundamentals.

Next, I analyze how human capital relates to firm outcomes upon entering bankruptcy. Surprisingly, given their aggressive pre-bankruptcy growth, firms with above-median college share are nine percent more likely to be liquidated within bankruptcy compared with low-college-share firms. Among firms that emerge and remain publicly listed, however, those with above-median college share are fourteen percent *less* likely to refile for bankruptcy within five years of emergence. These results suggest that human-capital-intensive firms may experience a different selection process within bankruptcy that reduces the likelihood of emergence for the weakest firms. Thus, while previous authors have argued that the debtor-friendly provisions of Chapter 11 may result in the excessive continuation of economically inviable firms (Bradley and Rosenzweig [1992], Hotchkiss [1995]), over-continuation may be a less important concern for human-capital-intensive firms.

Although the patterns I document may be consistent with a number of different channels through which human capital interacts with the bankruptcy process, I highlight two main interpretations. The first is human capital flight, the idea that human-capital-intensive firms are more vulnerable to the departure of valuable employees during bankruptcy. While existing theories of the bankruptcy process highlight potential conflicts of interest among a firm's claimholders (Bulow and Shoven [1978], White [1989], Gertner and Scharfstein [1991]), the decisions of an important class of non-financial stakeholders - employees - may also impact its behavior and outcomes. As preliminary evidence for this channel, I show that human-capital-intensive firms are more likely to be liquidated in bankruptcy when employees have better outside opportunities as measured by the industry unemployment rate. Moreover, this interpretation could help explain the pre-bankruptcy behavior of human-capital-intensive firms if managers fear that selling assets and reducing investment would hasten the exodus of valuable employees. Finally, the negative correlation between human capital intensity and post-bankruptcy failure is consistent with the possibility that workers choose to depart from the least efficient firms during bankruptcy. While human capital flight may

[5]They find that private lenders often loosen credit prior to bankruptcy by waiving covenants, extending loan maturities, and providing new financing. However, private secured lenders also increase the likelihood that firms file for bankruptcy instead of renegotiating successfully out of court.

help explain the main empirical patterns I document, the current data do not allow me to test this channel directly, so further investigation is deferred to future work.

A second interpretation for the results is that human capital intensity is associated with greater redeployability of a firm's physical assets. Shleifer and Vishny [1992] observe that firms with lower asset redeployability may be more reluctant to liquidate their assets because fire-sale discounts could lower asset prices below their values under best use. As noted by Baird and Rasmussen [2002], the physical assets of human-capital-intensive firms tend to be highly redeployable, consisting in some cases of little beyond real estate and office equipment. Greater asset redeployability could help explain the higher liquidation rates of human-capital-intensive firms, since these firms would be less likely to suffer from fire-sale discounts. I find preliminary evidence that this channel is at work, showing that liquidation rates are more sensitive to human capital intensity during times of industry distress.

The idea that human-capital-intensive firms have more redeployable assets may at first seem inconsistent with their lower rate of asset sales prior to bankruptcy. Instead, asset redeployability could help explain creditors' willingness to continue lending to human-capital-intensive firms prior to bankruptcy, while human capital flight could account for their greater demand for credit as postulated above. Thus, human capital flight and asset redeployability are complementary accounts of the behavior of human-capital-intensive firms during the length of the bankruptcy process. While I find suggestive evidence that both mechanisms are at work, an important avenue for future research is to more fully explore their interaction.

As an extension to my analysis, I re-evaluate my main results when including a proxy for firm-specific human capital, yielding additional implications for the interpretations I described above. While firms may suffer upon the departure of workers with either high *overall* levels of human capital or highly firm-specific human capital, workers themselves may be less likely to depart if they possess firm-specific human capital. Furthermore, the association between human capital and asset redeployability may vary for general versus firm-specific human capital. I measure firm-specific human capital using average employer tenure (i.e. the number of years an employee has worked at a given firm).[6] The main finding is that firm-specific human capital is associated with a lower likelihood of liquidation at the resolution of bankruptcy. This result is consistent with the idea that human capital flight is less likely to occur when human capital is firm-specific. In addition, it may indicate that firm-specific human capital is associated lower asset redeployability, which could arise from cospecialization between human and physical assets.

Overall, I document that human capital intensity is an important source of variation in firm behavior throughout the bankruptcy process. My results shed light on how the nature of financial distress may evolve as human capital becomes increasingly important to firms in the economy. The remainder of the paper is organized as follows. Section 2 describes the Chapter 11 sample, and Section 3 details the construction and characteristics of the human capital measures. Section 4 describes how human capital relates to the behavior of firms prior to bankruptcy, Section 5 presents evidence on firm outcomes at the resolution of Chapter 11, and Section 6 describes post-

[6] A number of authors in the labor literature have provided evidence for the relationship between tenure and firm-specific human capital. Topel [1991] shows that tenure is positively correlated to wages even after accounting for years of work experience, while Jacobson et al. [1993] show that the declines in wages that workers experience after involuntary displacements from their firms are positively correlated with tenure. These two lines of evidence validate tenure as a measure of firm-specific human capital by showing that employers compensate workers for tenure, and that much of the wage gains to tenure are lost when workers are forced to switch employers.

bankruptcy performance and survival for firms which emerge from chapter 11. Section 7 presents an extension of the results which distinguishes between general and firm-specific human capital, Section 8 presents robustness checks, and Section 9 concludes.

2 Sample description

I set out to construct a comprehensive set of publicly-held firms which enter Chapter 11 between 1980 and 2003. The sample period is chosen so that firms fall under the 1978 Bankruptcy Reform Act, which marked the most recent drastic change to the U. S. bankruptcy law.[7] To accomplish this task, I match the Compustat database with bankruptcy filings since January 1, 1980 in WebBRD (Bankruptcy Research Database),[8] the Capital Changes Reporter, and New Generation Research.[9] To minimize truncation bias for the most recent cases, I restrict the sample to firms which file before December 30, 2003. Consistent with the literature, I exclude firms in the finance and utilities industries (two-digit NAICS codes 22 and 52) due to differences in regulatory oversight and accounting standards for these industries. This data collection process yields a sample containing 1493 Chapter 11 filings by 1405 firms.

For each firm in the sample, I collect data related to three distinct phases of the bankruptcy process: firm characteristics prior to entering bankruptcy, firm outcomes at the resolution of bankruptcy, and post-bankruptcy performance and outcomes for firms which emerge and remain publicly listed. Financial accounting data are collected from Compustat and 10-Ks beginning five years before bankruptcy filing until five years after emergence (for firms which emerge), up to 2008. Annual stock returns are collected from CRSP. Following Asquith et al. [1994] and Kalay et al. [2007], I measure operating performance using *profitability*, defined as earnings before interest, depreciation, and amortization (EBITDA) divided by the book value of assets. Although earnings may be subject to manipulation and smoothing by managers, they are likely to be a reasonable proxy for cross-sectional differences in operating performance. In most of the analysis, I adjust profitability by subtracting its contemporaneous industry median among Compustat firms, which mitigates differences in accounting practices. Furthermore, the results are robust to measuring performance using operating income instead of EBITDA. Another possible problem with the *profitability* measure is that the book value of assets is likely to underestimate the value of human capital and intangible assets. However, the results are robust to normalizing EBITDA by total sales instead of book value, so this bias does not appear to drive the results.

To facilitate comparison to prior literature, I present two measures of leverage: the book value of liabilities divided by the book value of assets, and the book value of current and long-term debt divided by the book value of assets.[10] Book measures of leverage are more appropriate for

[7] The 1978 Bankruptcy Reform Act established the current system of federal bankruptcy courts and the regime of Chapter 11 reorganization, and became effective on October 1, 1979. More recently, the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 enacted moderate changes to the 1978 law, but the effects of these changes are excluded from my analysis.

[8] http://lopucki.law.ucla.edu/bankruptcy_research.asp, Accessed February 2008. The WebBRD covers firms with at least $100 million in assets which filed for bankruptcy starting in 1980. I am grateful to Lynn Lopucki for sharing his dataset for use in this paper.

[9] From bankruptcydata.com, accessed April 2009

[10] As discussed by Welch [2008], debt / assets may mismeasure the true variation in financial leverage across firms. Moreover, creditors of both financial and non-financial liabilities are important claimants in the process of bankruptcy,

capturing the borrowing behavior of distressed firms than market measures, since large declines in the market value of equity prior to bankruptcy would drive up the standard measure of market leverage (book value of debt / (book debt + market equity)) even when the underlying level of liabilities has not changed. Moreover, market values of debt are generally unavailable. In addition to profitability and leverage, I also collect data on employment, interest expenses, property, plants and equipment (PPE), and research and development (R&D) from Compustat and 10-Ks, and I collect data on equity values and returns from CRSP.

I gather information on the outcomes of the Chapter 11 cases from WebBRD, New Generation Research, court documents [11], 8-Ks, and news searches. Similarly to previous studies (Hotchkiss [1995], Kalay et al. [2007], Bharath et al. [2007]), I sort firm outcomes at resolution into four categories: *Emerged public, Emerged private, Liquidated*, and *Acquired*. *Emerged* firms are those which successfully confirm a plan of reorganization and exit bankruptcy as independent operating companies, and the *Emerged public* subsample consists of firms which subsequently appear in the Compustat database, while *Emerged private* indicates firms which were not subsequently listed in Compustat. Firms are classified as *Liquidated* if substantially all of their assets were sold in a piecemeal fashion, which can occur either within Chapter 11 or through a conversion to Chapter 7. *Acquired* firms are those which sold the majority of their assets as a going concern to a single purchaser. While the full sample is used for the analysis of firm behavior and outcomes prior to and during bankruptcy, the analysis of post-bankruptcy outcomes is restricted to the *Emerged public* sample due to data availability and to ease comparisons to the literature.

Overall, the firms in my sample are larger but in similar financial condition compared with most samples studied previously.[12] Table 1 presents selected summary statistics for the bankruptcy sample corresponding to the last fiscal year-end prior to filing, splitting the sample by firm outcome at the resolution of bankruptcy. The average (median) firm in the sample has revenues of $614 million ($126 million), which is substantially larger than those in most previous studies.[14] Unsurprisingly, the sample is quite highly-leveraged, with mean (median) liabilities over assets of 1.19 (0.88), and debt over assets of 0.71 (0.55). With the exception of Hotchkiss [1995] who reports liabilities over assets of 2.50, the firms in my sample are similarly leveraged compared

so in most of the analysis I use total liabilities divided by assets. Nonetheless, the results of the paper are insensitive to choice of leverage measure.

[11] Case dockets and documents were obtained cases starting in the 1990s via the Public Access to Court Electronic Records (PACER) system.

[12] However, one important caveat is that firms in my sample experience relatively less severe distress upon entering Chapter 11 compared with those studied by Hotchkiss [1995], who reports substantially higher financial leverage and more negative operating performance [13]. Because much of Hotchkiss [1995]'s sample is drawn from non-Compustat firms, these comparisons indicate that sample selection into Compustat introduces substantial differences in observable firm characteristics which should be taken into account when comparing our results.

[14] For example, Hotchkiss [1995] reports a mean sales of $ 260 million for her full sample. When I restrict my sample to match her sample period, mean sales is still twice as large as that in her sample. This discrepancy results from differences in data construction, as much of her sample is not listed in Compustat (her sample covers 806 bankruptcies while mine includes only 171 filings during the same period). When I restrict my sample to match the period examined by Gilson et al. [1990], firm size matches much more closely. Gilson et al. [1990] report a has a mean book value of $317 million and median of $49 million for 61 firms which file for bankruptcy, while my subsample of 92 firms has a mean book value of $270 million with median of $80 million. Thus, the discrepancies in firm size between my sample and previous ones results both from secular increases in firm size and from sample selection into Compustat.

with those in previous studies.[15] Gilson et al. [1990] report mean liabilities over assets of 1.01, and Weiss [1990] reports mean debt over book assets of 0.77. The mean (median) interest coverage in my sample is -7.56 (0.04), indicating that the majority of firms in the sample have serious cashflow shortfalls, and some experience extreme shortfalls due to very low earnings. The average profitability for the sample is -0.25 with a median of 0.001, indicating that these firms suffer from quite severe operating difficulties in addition to pure financial distress stemming from high leverage.

Among the four bankruptcy outcomes, nearly half of the firms emerge from bankruptcy as independent entities, with 30% emerging under public ownership and 18% under private ownership. Most of the remaining (38%) are liquidated in bankruptcy, while 11% are acquired. Outcomes could not be ascertained for the final 4% of firms. Consistent with Lemmon et al. [2009] and Denis and Rodgers [2007], pre-bankruptcy characteristics differ strongly between firms which are ultimately liquidated and acquired in bankruptcy and those which emerge. Comparing the characteristics of firms with different outcomes reveals a preliminary picture of the selection process within bankruptcy. Firms which are liquidated tend to be smaller, have lower profitability, and have lower leverage prior to bankruptcy than those which emerge, and most of these differences are significant at the 1% level for both means and medians. Thus, consistent with Lemmon et al. [2009], the Chapter 11 process seems to select firms which are relatively more economically distressed into liquidation. Acquired firms tend to be smaller and have lower profitability than those of the other two groups, while their leverage falls between that of emerged and liquidated firms. Thus, firms which are acquired appear to be relative inefficient firms that may be favorable targets for industry rivals. The duration of Chapter 11 is substantial, lasting an average of 19 months in the full sample. Furthermore, firms which are liquidated spend significantly longer in bankruptcy than those which emerge, with mean (median) durations of 22 (16) months versus 17 (13) months, respectively.

Next, I describe the path of economic and financial distress in the ten years prior to bankruptcy. In the timing scheme I use throughout the paper, *normalized year* denotes the fiscal year relative to bankruptcy filing, where year -1 is the fiscal year-end immediately before the date of filing.[16] I define my initial measure of the onset of financial distress as in Asquith et al. [1994], as the first of at least two consecutive years of interest coverage (EBITDA / interest expense) below one, or any year in which interest coverage is less than 0.8.[17] As shown in Table 2, as of ten years prior to bankruptcy, 21 percent of firms are already experiencing distress, a fraction which rises to 86 percent by the year of bankruptcy filing. On average, firms experience four years of financial distress before filing for bankruptcy.

The inability to cover interest payments can result from either financial or economic distress, or a combination of both, so to decompose these two components, Table 2 presents the medians of profitability and leverage as well as year-to-year changes in both variables for the bankruptcy

[15]These differences persist when restricting my sample to the same sample period (1978 to 1989) as Hotchkiss [1995] or restricting to firms with less than $400 million in total assets to obtain similar means in firm size. Thus, the differences in financial condition between my sample and that of Hotchkiss [1995] appears to be driven by the inclusion of non-Compustat firms in her sample.

[16]I omit year 0 in all analyses because many firms cease filing with the SEC prior to entering bankruptcy, so the sample size declines substantially by year 0 and may be subject to substantial selection bias.

[17]This variable is missing for firms which do not report interest coverage. Results are similar if I consider firms in the bottom quartile of interest coverage by industry.

sample. Sample statistics are also reported on an industry-adjusted basis by subtracting contemporaneous medians within three-digit NAICS industries from the full Compustat database. For three-digit industries with fewer than five firms in a given year, industry-adjusted measures are constructed using two-digit NAICS industries instead. Firms exhibit both deteriorating profitability and rising leverage in the ten years leading up to bankruptcy, suggesting that the majority of bankrupt firms suffer from a combination of financial and economic distress. Median profitability drops from 0.116 in year -10 to -0.003 in year -1, while median leverage increases sharply from 0.61 to 0.93.[18] Median changes in profitability and leverage are significantly different from zero starting two years prior to bankruptcy at the 1% percent level.

The industries of firms headed toward bankruptcy also exhibit declines in profitability and increases in leverage, but sample firms represent outliers within their industries. The third and fourth columns under "Leverage" and "Profitability" in Table 2 compare median year-to-year changes in the two variables for the Chapter 11 sample and the contemporaneous medians among Compustat firms in the same industries as the Chapter 11 sample. Median changes in profitability among industry peers range from -0.001 to -0.003, compared with a range of -0.006 to -0.036 among Chapter 11 firms. Similarly, median increases in leverage are an order of magnitude smaller among industry peers compared with sample firms. Industry-adjusted levels of both profitability and leverage are significantly different from zero starting nine years prior to bankruptcy at the 1% percent level using the Wilcoxon ranksum test.[19] Consistent with the findings of Asquith et al. [1994], these results suggest that although industry declines may exacerbate their difficulties, firms enter bankruptcy mainly as a result of idiosyncratic factors.

The descriptive statistics in Table 2 suggest several dimensions along which to explore how human-capital-intensive firms might experience the path toward distress differently: the timing of bankruptcy relative to the onset of financial distress, the rate of decline in profitability, and the rate of increase in leverage. I will examine these and other aspects in more detail in Section 4 after describing the human capital measures I use.

3 Human capital measures and industry composition

Because publicly-available data sources do not provide consistent firm-level data on human capital for my sample,[20] I measure human capital at the industry level using data from the Current Population Survey (CPS).[21] Conceptually, a firm's human capital encompasses all of the characteristics of its employees that contribute to its productive output, including schooling, training, health, and innate ability. Among the many possible characteristics related to human capital, schooling has been the main focus of human capital research since the seminal contributions of Becker [1962]

[18] By comparison, median industry-adjusted debt / total assets in my sample increases from 0.05 in year -5 to 0.29 in year -1, showing that non-financial liabilities are not driving the increase in leverage. These statistics are very similar to those presented by Kalay et al. [2007].

[19] Kalay et al. [2007] also document that pre-bankruptcy leverage exceeds industry median levels nine years prior to bankruptcy, while profitability falls below industry median levels by five years prior.

[20] While Compustat reports total numbers of employees, staff expenses, and selling, general, and administrative expenses, the latter variables suffer from low data coverage and encompass a wide range of employee-related expenses, with accounting standards varying across firms.

[21] The CPS is a monthly survey conducted by the Bureau of the Census consisting of about 100,000 individuals across the population.

and Mincer [1974], and it is a natural place to start for constructing a consistent measure which can be applied to a wide range of firms. To summarize levels of worker schooling, I focus on the share of college-educated workers in the labor force, which is denoted by *college share* in the rest of the analysis. I emphasize college education because trends in wage growth and productivity suggest that college-educated workers have been the primary drivers of economic growth in the past few decades[Jorgenson et al., 2003], and much of the work relating finance and human capital has highlighted the role of knowledge workers in the 21st-century firm [Zingales, 2000].[22] I define *college share* for each industry in each year between 1980 and 2003 as the share of full-time, employed workers with at least 16 years of education.[23]

The college attainment of the U. S. workforce has increased steadily in the last several decades. Based on the CPS sample, the average college share among full-time workers in the private sector has increased dramatically from 15.3% in 1980 to 25.4% in 2003, as shown in Figure 1. Furthermore, these trends are driven largely by within-industry increases in education level. But does the secular increase in college share reflect real changes in the importance of human capital, or simply demographic changes as college education has become more widely-available? Since both the supply of college-educated workers and the returns to college education rose during this period, supply changes alone cannot account for the rising college premium(Katz and Murphy [1992]). Furthermore, many researchers suggest that the information technology revolution has increased the returns to the cognitive and analytical skills of college graduates[Autor et al., 2003]. As I show in Appendix Section A.4, industries with higher college share also have higher returns to college education, and within-industry increases in college share are also accompanied by increases in returns to college. These two pieces of evidence suggest that college share reflects real variation in the value of human capital in production within and between industries. However, because the drivers of cross-sectional versus time-series variation in college attainment are likely to differ substantially, I consider both time-varying and cross-sectional measures of college share which will be described in more detail below.

Although I focus on schooling, it is important to note that there are many other facets of human capital including experience, training, and personal attributes such as innate ability, motivation, and health. Work experience has been a major element of human capital literature since the work of Ben-Porath [1967] and Mincer [1974], but it is problematic for my purposes because experience is highly collinear with age, which may confound its interpretation. Training, often sponsored by firms themselves, is another significant component of human capital (Acemoglu and Pischke [1999], Autor [2001]), but a lack of comprehensive and standardized data on training across firms or industries make it difficult to incorporate in my setting (Bassi et al. [2000]). Finally, data limitations hamper the ability to account for other components of human capital such as school quality and innate ability.

While my main results rely on the college share measure to proxy for the relative importance of human capital across industries, I attempt to distinguish between general and firm-specific human capital in an extension to my results in Section 7. Because of the inherent difficulties in separating these two components of human capital and distinguishing firm-specific human capital from other characteristics of workers, firms, and industries, the measure I present should be interpreted with caution. With this caveat in mind, I proceed to describe a simple proxy for firm-specific human

[22] My results are qualitatively similar if I use the number of years of educational attainment.

[23] See the Data Appendix for details on the construction of this measure

capital.

Conceptually, a straightforward view is that firm-specific human capital consists of the skills which arise from the accumulation of on-the-job experience and from investments made by the firm and employee (e.g. employer-sponsored training, effort spent learning firm procedures) to specialize the employee's skills to match the firm's needs [Becker, 1964]. A rather different view asserts that firm-specific human capital arises from matching, in which information about the suitability of a worker for a particular firm is gradually revealed over time Jovanovic [1979]. However, neither the extent of investment in firm-specific skills nor the accumulation of knowledge about match quality can generally be observed, making measurement of firm-specific-human-capital challenging.

Nonetheless, under both views the presence of firm-specific human capital generates a surplus as long as the firm and employee remain attached. The value of this surplus provides an incentive for maintaining the employment relationship, thus leading to higher observed tenure in firms where firm-specific human capital is important. The virtue of using employer tenure as a proxy for firm-specific human capital is that higher tenure (and its corollary, lower turnover) is an outcome shared among the various mechanisms for attaining firm-specific human capital,[24] so its validity does not rest on any particular model or channel. To make sure both the firm and employee have an incentive to maintain their relationship, most of these models also predict that firms and employees share the surplus generated by firm-specific human capital,[25] so a test of tenure as a proxy for firm-specific human capital is whether wages tend to rise with employer tenure. Confirming this prediction, the positive relationship between wages and tenure has been well-documented empirically,[26] and I replicate these results in my sample in Appendix Section A.4. To construct my empirical proxy for firm-specific human capital from the CPS, I define *employer tenure* for each industry in each year as the average tenure among full-time, employed workers in the private sector(see Appendix Section A.3 for details).

An obvious weakness of the employer tenure measure is that workers can have high tenure for reasons unrelated to firm-specific human capital. In particular, some industries could be associated with higher rents or different institutions, often leading both to higher tenure and higher wages (Katz and Summers [1989]). For example, tenure tends to be high in the public sector, although it is not obvious that firm-specific human capital is more important for government workers. However, a substantial literature on displaced workers (most notably Jacobson et al. [1993]) shows that earnings declines for workers displaced from their employers due to involuntary layoffs are significantly correlated with worker tenure, a result which is inconsistent with a simple rent-based explanation. These results provide evidence both that tenure is correlated with productive value and that this source of human capital is degraded when workers are separated from the original firm. Another possible confound is that labor unions provide to more bargaining power for workers in addition to greater job security. Indeed, union members have an average of 12.5 years of tenure compared with 6.8 for non-union members. However, in my analysis I test for the robustness of my results to controls for industry unionization, and find that the average percentage of unionized workers in an industry is generally insignificantly related to bankruptcy outcomes, and

[24] See Parsons [1972], Hashimoto [1981], and Jovanovic [1979] for theoretical models which predict the relationship between firm-specific human capital and lower turnover.

[25] Becker [1964] advanced the intuitive notion that firms and employees should share both the costs of accumulating firm-specific human capital and the surplus it generates, while Hashimoto [1981] first formalized the sharing of surplus.

[26] See for example Topel [1991]

its inclusion does not affect my results.

Between 1981 and 2002, employer tenure increased from 6.3 years to just over 8 years by 1987 and subsequently declined to 6.6 years by 2002 (Figure 1). The secular trend in employer tenure may be caused by three main types of forces: demographic changes, business cycle effects, and changes in the importance of firm-specific human capital. Because tenure tends to rise with a worker's age, the initial rise in tenure may be partially attributed to the aging of the baby boomer generation. Furthermore, the increased labor force attachment of women also contributed to rising tenure levels. The decline in tenure levels since the late 1980s has been well-documented, and can largely be attributed to job loss in high-tenure industries such as the manufacturing sector (Farber [2007]). Since the tenure measure I use is based on workers who remain employed and low-tenure workers are more likely to be laid off during downturns, tenure levels are counter-cyclical. From this discussion, utilizing time-series variation in employer tenure may be problematic for measuring firm-specific human capital due to its sensitivity to demographic and business cycle effects.

In summary, while college share and employer tenure are imperfect proxies for human capital, they satisfy several key criteria. Both are consistently measured across time and across industries, and both measures are positively related to wages, indicating that they are correlated with the value of employees' services to their firms. Furthermore, the wage premia arising from employer tenure are diminished when workers are displaced involuntarily from their jobs, consistent with the role of tenure as a proxy for firm-specific skills.

Because both proxies can be influenced by factors unrelated to human capital which vary across time and across industries, I consider several variations of *college share* and *employer tenure* which differ in their exploitation of time series and cross-sectional variation: 1) panel measures which are calculated for each industry and year, 2) cross-sectional averages within each industry, and 3) cross-sectional levels in 1980. For each industry i, year t, the variations for *college share* are defined as

$$CollegeShare_{i,t}^{panel} = \frac{\sum_{j \in i} w_{j,t} college_{j,t}}{\sum_{j \in i} w_{j,t}}$$

$$CollegeShare_{i}^{average} = \frac{\sum_{t=1980}^{T=2003} CollegeShare_{i,t}}{24}$$

$$CollegeShare_{i}^{initial} = \frac{\sum_{j \in i} w_{i,1980} college_{j,1980}}{\sum_{j \in i} w_{j,1980}}$$

where $w_{j,t}$ is the CPS sampling weight and $college_{j,t}$ is a dummy variable for college education for individual j. These measures are defined similarly for *employer tenure*.

The panel measures may be problematic because of business-cycle fluctuations and well-documented secular changes in demographics, which particularly affect employer tenure. As long as these demographic trends affect all industries, using year fixed-effects would help mitigate their effects when using the panel measures. Other ways to capture cross-sectional variation are by taking the average of college share and employer tenure within each industry across the sample period and by taking their initial levels at the beginning of the sample period. Cross-sectional rankings

of industries by both college share and employer tenure have also been persistent over time[27], so the $average$ and $initial$ measures represent good summaries of cross-sectional variation. Due to the descriptive nature of this study, I will keep the source of variation as transparent as possible by focusing on results using the $average$ measures, although the results are robust to using the $panel$ and $initial$ measures[28].

Table 3 describes the industry composition for the bankruptcy sample along with the $average$ measures of college share and employer tenure. For brevity, industries are collapsed to two-digit NAICS groups, although the human capital variables are measured at the three-digit level in the analysis. The bankrupt firms come from 18 distinct two-digit NAICS groups, with the largest number of filings occurring in the manufacturing and retail sectors. Industry shares are consistent with those reported in previous studies [29] as well as the Compustat universe, although retail is slightly over-represented within the bankruptcy sample and manufacturing is under-represented. College share ranges from 7 percent in agriculture to 55 percent in educational services, while average employer tenure ranges from 4.1 years in accommodation and food services to 9.5 years in wood product manufacturing.

Table 4 displays the correlations between the cross-sectional human capital measures and firm characteristics for the bankruptcy sample which have been averaged within the 70 three-digit NAICS industries in the bankruptcy sample. Firm characteristics are equally-weighted and measured at the fiscal year-end before filing. *Q* is defined as (book value of assets + market value of common equity - book value of equity - book value of deferred taxes) / book value of assets, *tangibility* is defined as net property, plants and equipment (PPE) / book value of assets, and *R&D/book* is R&D expenses / total assets. *Profitability* is as defined above, and in this table and the remaining analysis I use the definition of *Leverage* based on total liabilities / book value. College share and employer tenure are negatively correlated with a correlation coefficient of -0.12.[30] College share is positively correlated with Q and R&D intensity, while it is negatively correlated with log sales, leverage, tangibility, and profitability. Employer tenure exhibits precisely the opposite pattern of correlation.

Overall, Tables 3 and 4 show that firms with high college share tend to be found in the high-technology and skilled service sectors, and they are characterized by higher growth opportunities and R&D, and low levels of asset tangibility. In contrast, firms with high levels of employer tenure human capital tilt heavily toward manufacturing, and is associated with more mature businesses that have high profitability, lower growth opportunities, and higher asset tangibility. These classifications fit with intuitive notions of the kinds of firms which require high levels of human capital and more-specific human capital. While professional service and high-technology firms need workers with the advanced cognitive skills associated with high levels of overall human capital, manufacturing firms rely on complex production systems which are largely firm-specific and may require extensive on-the-job training to maximize employee productivity. However, industries which differ by human capital are also different on a variety of other dimensions, so it is important to take into account potential biases from omitted variables in my results. I address this issue explicitly in

[27]The spearman rank correlations across three-digit industries are 0.68 between 1980 and 2003 for college share and 0.78 between 1981 and 2002 for employer tenure.

[28]Results are robust when using the $panel$ measures with either year or industry fixed-effects.

[29]See Hotchkiss [1995] and Gilson [1990]

[30]The correlation between tenure and college education at the worker level in the CPS supplements which report employer tenure is -0.02.

Section 8. A remaining concern is that my measures do not accurately capture the level of human capital in the firms in my bankruptcy sample. As documented by Abowd et al. [2005], there is substantial heterogeneity in the human capital content of firms within an industry. Thus, human capital levels for individual firms are measured with error by my industry-level proxies. Due to lack of firm-level data on human capital, however, further investigation of these concerns is left to future research.

4 Human capital and pre-bankruptcy behavior

As documented by Asquith et al. [1994], firms respond to distress in a number of ways prior to entering bankruptcy including asset sales, out-of-court restructuring, and reductions in capital expenditures, and in this section I explore the relationships between human capital and pre-bankruptcy behavior. As a first indication of potential differences in the extent to which firms respond to distress prior to entering bankruptcy, I consider in Table 5 how human capital relates to the length of time between initial distress and bankruptcy. The table shows results from OLS regressions of the number of years between the onset of distress and bankruptcy filing, where the onset of distress is defined using five distinct measures based on interest coverage and stock returns during the ten years prior to bankruptcy. In each specification, the sample is restricted to firms which fall under each definition of distress at the time of bankruptcy filing.

In specification (1), the onset of distress is defined as in Section 2 and Asquith et al. [1994], as the first of at least two consecutive years of interest coverage (EBITDA / interest expense) below one, or any year in which interest coverage is less than 0.8. The result shows that college share is positively correlated with the length of time between the onset of low interest coverage and bankruptcy, with a coefficient significant at the 1% level. One potential issue with the definition of distress onset in specification (1) is that industries with different levels of human capital differ in their average levels of interest coverage[31] or in the lengths of their business cycles. Thus, in specification (2), I present results in which the onset of distress is defined as having interest coverage in the bottom quartile of an industry. College share is positive and significant at the 10% level in this specification. This is a similar albeit slightly weaker result compared to the first specification, indicating that the longer period of low interest coverage prior to bankruptcy for human-capital-intensive firms may be partially due to industry factors. The magnitudes of the estimates in these two specifications indicate that a one-standard-deviation increase in college share is associated with a three- to four-month longer period between low interest coverage and bankruptcy filing.

In specifications (3) through (5), I consider definitions of the onset of distress using stock returns instead of interest coverage. Because interest coverage measures only current shortfalls in cashflows compared with interest expenses, looking at returns may allow me to more accurately identify shocks to fundamentals. In specification (3), I define the onset of distress as having an annual return of -30% or lower, and I find that college share is negatively correlated with the length of time between low returns and bankruptcy. However, the magnitude of this result is small and it is not statistically significant. In the next two regressions, I attempt to distinguish between firm- and industry-specific distress. In specification (4), I define the onset of distress as having

[31] In the overall Compustat universe during the sample period, interest coverage has a correlation coefficient of -0.02 with respect to college share which is significant at the 1% level.

stock returns in the lowest quartile of an industry to identify firms which are experiencing distress relative to their industries. In this regression, a one-standard-deviation increase in college share is associated with a two month shorter period between returns in the lowest quartile in an industry and bankruptcy filing, and the result is significant at the 10% level.

Finally, in specification (5), I consider the period between the onset of industry distress and bankruptcy filing, where industry distress is defined as median annual stock returns of -30% or lower among Compustat firms in a three-digit NAICS industry, similar to that used by Acharya et al. [2007]. I find that human-capital-intensive firms experience a shorter period between the onset of industry distress and bankruptcy filing, with a one-standard-deviation increase in college share being associated with a nine month shorter period between the onset of industry distress and bankruptcy filings. The results from specifications (3) through (5) show that human-capital-intensive firms file for bankruptcy more quickly following low stock returns, indicating that they may be more vulnerable to both industry and firm-specific shocks to fundamentals.

In Table 6, I further investigate the relationship between human capital and the evolution of financial and economic distress for firms prior to bankruptcy filing by analyzing the correlations between college share and year-to-year changes in profitability and leverage during the ten years prior to bankruptcy in OLS regressions. In particular, the differences in the timing of bankruptcy I described above for firms with different levels of human capital could be related to differences in the speed at which firms decline in profitability or increase in leverage prior to bankruptcy. Using within-firm changes for the dependent variables also helps to overcome sample selection bias due to changes in the composition of firms in the sample, particularly as firms drop out of the sample in year -1. Because firms with lower levels of profitability and higher levels of leverage are more likely to have missing data, regressions based on levels would show milder changes than firms experience individually. To further account for changes in sample composition as firms approach bankruptcy, each specification contains dummy variables for the year relative to bankruptcy filing (*norm year*).[32]

As shown in columns (1) and (2), higher college share is associated with faster declines in both unadjusted and industry-adjusted profitability. However, the correlations are small in magnitude[33] and statistically insignificant. Thus, it is unlikely that underlying differences in the rate of economic decline are major driver of differences in the behaviors of firms in response to financial distress. In particular, since human-capital-intensive firms persist for longer periods with low interest coverage prior to filing for bankruptcy, they might be expected to exhibit slower declines in profitability, which is the opposite of the result I find.

Specifications (4) and (5) present the relationship between college share and the rate of change in unadjusted and industry-adjusted leverage prior to bankruptcy. The estimates in both regressions are very similar and statistically significant at the 5% level, indicating that higher college share is associated with faster increases in firm leverage. A one-standard-deviation increase in college share is associated with a 0.01 per year faster increase in either unadjusted or industry-adjusted leverage. Thus, human-capital-intensive firms may rely more on increases in borrowing to supplement cashflow shortfalls as they approach bankruptcy. If creditors are more lenient to-

[32]The results are similar for the balanced panel. Omitting the dummy variables for norm year also yields qualitatively similar results.

[33]A one-standard-deviation increase in college share is associated with a 0.001 per year faster decline in profitability. The magnitude of this effect is similar to the median decline in profitability between ten and nine years prior to bankruptcy in the overall bankruptcy sample as shown in Table 2.

ward human-capital-intensive firms, then this result could help to explain the longer delays in their bankruptcy filings following low interest coverage. Furthermore, it could be that their reliance on increased borrowing also makes them more vulnerable to economic shocks as creditors pull back their lending, helping to explain the faster entry into bankruptcy following low stock returns and industry distress for human-capital-intensive firms described above. However, these interpretations must be advanced with caution since leverage increases could result either from increases in borrowing or from asset sales. I examine these possible explanations in more detail below.

Table 7 investigates how human capital relates to changes in firm scale during the ten years prior to bankruptcy. The dependent variables for the first regression in each pair are year-to-year changes in log levels of debt, non-debt liabilities, asset size, capital expenditures, and employment. The second regression of each pair adjusts the change in log levels by subtracting its industry median among firms in the same three-digit NAICS industry in Compustat. Each specification also includes dummy variables for the normalized year relative to bankruptcy filing. The results show that college share is consistently associated with greater growth in total debt, non-debt liabilities, total assets, capital expenditures, and employment. The coefficients on college share are significant at the 1% level in all specifications. In particular, the correlations persist when the dependent variables are adjusted by industry, so the result does not appear to be driven by differences in the rate of firm growth across industries. Indeed, in each specification the effect of college share becomes even larger after adjusting for industry. Thus, although firms headed toward bankruptcy tend grow slower than other firms in the same industry, distressed firms which are human-capital-intensive exhibit smaller reductions in growth relative to their industries. While the magnitudes of the specifications I present are somewhat difficult to interpret in economic terms, the main result I highlight is that human-capital-intensive firms are more aggressive in continuing their borrowing and growth as they approach bankruptcy. I reach the same conclusion with similar significance levels when using logit specifications for increases in levels of each variable, percent changes in levels, or changes in levels normalized by the book value of assets in a base year.

Taken together, the results in this section reveal rather complex patterns in the relationship between human capital and the path toward bankruptcy. However, it is important to note throughout the analysis that the results are subject to measurement error and omitted variable biases. Nonetheless, as I detail in Section 8, the results for the timing of bankruptcy and changes in firm scale are generally robust to the inclusion of additional controls for median industry measures of asset tangibility, Q, and R&D expenditures, as well as the inclusion of two-digit industry fixed-effects.

I now attempt to interpret the results in light of the two interpretations discussed in the introduction. Initially, the results appear inconsistent with the idea that human capital flight is an important problem for human-capital-intensive firms in distress, since these firms are more likely to experience *growth* in employment as opposed to shrinkage. However, if managers anticipate that layoffs and restructuring actions are likely to trigger an exodus of key workers, then gradual cutbacks may in fact be less feasible for human-capital-intensive firms. Thus, their less conservative tactics may be a response to the anticipation of human capital flight, although such flight is typically not observed in practice. My second interpretation is that human-capital-intensive firms could have assets which are more redeployable. In this case, they might be expected to engage in more asset sales in an effort to remedy financial distress prior to bankruptcy, which is inconsistent with the results I show. However, since human-capital-intensive firms are able to increase their borrowing prior to bankruptcy, they may not need to resort to asset sales until bankruptcy itself. The willingness of creditors to extend credit may in turn reflect the greater redeployability of the

assets of human-capital-intensive firms.

As suggested above, creditors seem to play an important role in the pre-bankruptcy behavior of human-capital-intensive firms. Human-capital-intensive firms appear to be less willing or less able to engage in cutbacks to remedy financial distress prior to bankruptcy, and they rely more on increased borrowing to finance their cashflow shortfalls. In light of the discussion above, creditors may be more willing to loosen credit for with human-capital-intensive firms either because they anticipate costs due to human capital flight if firms are forced to cut back their operations, or because the greater redeployability of the assets of these firms makes it easier to redeem the value of collateral in bankruptcy.[34] Because of their greater reliance on credit, the result that human-capital-intensive firms are quicker to file for bankruptcy after stock market declines may be a consequence of creditor tightening, since creditors may force firms into bankruptcy after observing shocks to fundamentals. Anecdotally, human-capital-intensive firms seem to rely more on bank credit compared with low-human-capital firms, so this interpretation is consistent with the results documented by Asquith et al. [1994] that banks may loosen credit during out-of-court restructuring, but firms which rely on bank credit are more likely to file for bankruptcy.

Since pre-bankruptcy behaviors are likely to reflect the anticipated outcomes of bankruptcy itself, to obtain further insights into the role of human capital I next turn to the ultimate fates of firms at the resolution of bankruptcy.

5 Firm outcomes at the resolution of bankruptcy

In this section, I examine the relationship between human capital and the choice between emergence, acquisition, and liquidation of the firm at the resolution of bankruptcy. I first discuss univariate comparisons between the bankruptcy outcomes for firms with different degrees of human-capital-intensity. When splitting the sample by median college share, I find that low-college-share firms have a 55% likelihood of emerging from bankruptcy, a 35% chance of liquidating, and a 10% chance of being acquired in bankruptcy. In contrast, high-college-share firms have a 44% chance of emerging from bankruptcy, a 44% chance of liquidation, and a 12% chance of being acquired. Based on this initial comparison, human-capital-intensive firms are less likely to emerge from bankruptcy and are more likely to be liquidated, although their probability of acquisition is similar to that of low-human-capital firms. However, as uncovered in previous studies, other firm characteristics are also correlated with firm outcomes in bankruptcy, so I next turn to multivariate analyses.

In Table 8, I show that the relationship between college share and higher liquidation rates at the resolution of bankruptcy remains consistent in multivariate specifications. In these specifications, I conduct multinomial logit regressions where the dependent variable indicates the choice between emergence, acquisition and liquidation, with emergence as the omitted category. Specification (1) includes only college share as the independent variable in addition to a constant term, and the estimated coefficient indicates that the marginal effect of a one- standard-deviation increase is a five percent increase in the likelihood of liquidation. However, a similar increase in college share is

[34] Gilson et al. [1990] find that firms with more intangible assets are more likely to complete a successful restructuring, arguing that the higher bankruptcy costs associated with intangible assets provide better incentives for creditors to renegotiate.

associated with only a one percent increase in the probability of acquisition, with an insignificant coefficient.

Specifications (2) and (3) include firm characteristics which have been shown previously to impact bankruptcy decision-making. In particular, Denis and Rodgers [2007] find that larger firms and those with higher pre-bankruptcy leverage are more likely to emerge. This evidence is corroborated by Lemmon et al. [2009], who in addition find that industry-adjusted profitability is positively related to emergence. Following this previous literature, I include controls for log sales, leverage, and industry-adjusted profitability measured in the last fiscal year prior to the bankruptcy filing.[35]

Specification (2) shows that including the controls without college share yields similar results to previous studies. Both firm size and leverage are negatively and significantly correlated with liquidation probability. A one-standard-deviation increase in log sales is associated with a three percent decline in liquidation probability, while an analogous increase in leverage is associated with a nine percent decrease in liquidation probability. I also find that industry-adjusted profitability is negatively and significantly related to liquidation rates, with a one- standard-deviation increase in profitability being associated with a five percent decline in the probability of liquidation.

In specification (3), both college share and the control variables are included in the regressions, and the results remain consistent with those in specifications (1) and (2). While the magnitude of the marginal effect of college share is reduced by one third when controls are added, it remains economically significant and the coefficient is statistically significant at the five percent level. A one-standard-deviation increase in college share is associated with a four percent increase in the probability of liquidation, computed at the means of the other variables. The marginal effects of the control variables remain very similar in both magnitude and significance when college share is added, indicating that the effects of firm size, leverage, and profitability do not seem to be driven by correlation with human capital. Thus, although the controls may be imperfect proxies for factors unrelated to human capital which influence bankruptcy outcomes, the consistency of my findings indicate that the effect of college share does not seem to be driven by variation in firm size or the extent of financial or economic distress prior to bankruptcy.

Furthermore, the inclusion of human capital in regressions of bankruptcy outcomes has little impact on the results documented in previous literature. The lower liquidation rate for larger firms could be because of their greater scope for asset restructuring and operating improvements by divesting assets and refocusing their strategy.[36] Furthermore, it may also be more costly to liquidate larger firms due to the financing constraints of potential buyers (Shleifer and Vishny [1992], Acharya et al. [2007]). Firms with higher leverage may emerge at a greater rate both because they are more likely to suffer from financial as opposed to economic distress (Lemmon et al. [2009]), and because creditors have a greater incentive to promote continuation when insolvency is more severe and their claims become risky. Although Denis and Rodgers [2007] do not find a relationship between pre-bankruptcy profitability and liquidation probability, my results are consistent with those of Lemmon et al. [2009] and the intuition that pre-bankruptcy operating performance should be positively correlated with going concern value.

I now describe a basic framework for interpreting the results. In a simplified view of the

[35] Using unadjusted profitability instead of industry-adjusted profitability yields similar results.

[36] As shown by Kalay et al. [2007], firms which emerge from Chapter 11 show significant reductions in size and improvements in profit margins, and Denis and Rodgers [2007] shows that reductions in asset size are correlated with the probability of emergence.

liquidation decision in bankruptcy, firms are liquidated if their liquidation value exceeds the continuation value of their assets. If the control variables account for the continuation value of the firm prior to bankruptcy, then the relationship between human capital and liquidation rates which I observe could be due to either changes in continuation value during bankruptcy or to differences in liquidation value. As I mentioned in the introduction, I highlight two potential interpretations for the results.

First, I venture that human capital flight may lead to decline in the continuation value of the firm during bankruptcy. Analogous to physical assets which are collateral for creditors, a firm's human capital acts in a way as both an asset and a liability. In return for their service, the firm implicitly owes workers a stream of future wages. However, while bankruptcy law contains provisions such as the automatic stay[37] to prevent creditors from seizing collateral which might be critical to the firm's going concern value, the law does little to protect the going concern of human capital. As the firm's survival becomes uncertain due to financial distress, it may become optimal for workers to leave the firm for better employment opportunities, potentially destroying going concern value. Indeed, firms routinely claim that employee turnover is a significant threat that would hamper efforts to reorganize or sell the firm. It is important to note that even if human capital flight does influence the liquidation decision within bankruptcy, many other factors are also at work in the bankruptcy process. Indeed, if the pro-debtor bias of the U. S. bankruptcy code tilts toward over-continuation as suggested by Hotchkiss [1995] and Bradley and Rosenzweig [1992], then human capital flight may actually result in more efficient asset allocation.

The human capital flight interpretation can also help to shed light on the pre-bankruptcy behavior of human-capital-intensive firms described in the previous section. Due to the restrictions attendant to court supervision, it is likely that human capital flight is more important within bankruptcy than prior to bankruptcy.[38] If human capital flight is most salient within bankruptcy, then this interpretation may also help explain the aggressive growth of high-college-share firms prior to bankruptcy. If managers are aware that human capital flight is likely to trigger liquidation in the event of bankruptcy, they may optimally continue to invest and grow the firm during financial distress in hopes that the firm would recover.

The second interpretation of the results is that human-capital-intensive firms have assets which are more readily redeployable, thereby resulting in higher liquidation values. As illustrated in Table 3, industries with the highest levels of human capital generally center around high-skilled services, so human-capital-intensive firms may tend to have generic physical assets such as real estate and computer equipment which are more easily repurposed[39]. Consistent with this idea, Baird and Rasmussen [2002] argue that human-capital-intensive firms have few dedicated assets,

[37]The automatic stay is an injunction which prevents creditors from collecting on their debts or seizing assets without court permission.

[38]Bankruptcy does have several specific implications for employees. Wages and benefits garnered prior to bankruptcy filing receive priority status up to $4,925, which are paid in full at the end of bankruptcy proceedings. As part of the first day of bankruptcy court proceedings, many firms obtain a court order to continue compensating their employees under the arrangements which were in place prior to bankruptcy. However, the increased scrutiny of the court is likely to limit firms' abilities to retain employees by raising wages, increasing benefits and perquisites, or providing retention incentives. In particular, when creditors have security interest in a firm's working capital, the debtor-in-possession must obtain permission from the court and agreement from the creditors to use proceeds of this "cash collateral" to fund ongoing operations including employee wages.

[39]As argued by Autor et al. [2003], the increased demand for educated workers may be driven by strong complementarities between computers and the nonroutine cognitive tasks prevalent in high-skilled services.

so it is less worthwhile to reorganize them as going concerns during bankruptcy.

Although thorough tests of the channels through which human capital may influence the liquidation decision within bankruptcy are beyond the scope of the current paper, I offer two pieces of tentative evidence which suggest that both of the channels I discussed above may be at work. If human capital flight leads to more liquidations of human-capital-intensive firms during bankruptcy, than the effect of college share in the regressions of bankruptcy outcomes should be greatest when external labor demand is high. As a proxy for the demand for labor, I calculate the unemployment rate in the year prior to bankruptcy for the civilian population between the ages of 25 and 54 in each three-digit NAICS industry, adjusted by the average industry unemployment rate for the period between 1980 and 2003 to account for differences in the natural rate of unemployment across industries.[40] Table 9 presents results replicating specification (3) of Table 8, but splitting the sample by the median value of the unemployment rate in the year prior to bankruptcy [41]. Consistent with human capital flight, the results indicate that during times of low unemployment (i.e. high labor demand), firms with higher college share are differentially more likely to be liquidated in bankruptcy. While the marginal effect of college share on liquidation is 55 percent larger when unemployment is low compared to when it is high, the difference in the coefficients is not significant, so these results should be interpreted with caution. Furthermore, it should be noted that the unemployment rate may be correlated with other economic conditions which also affect bankruptcy outcomes. Nonetheless, this analysis provides some tentative evidence that human capital flight may induce liquidation of human-capital-intensive firms.

I conduct a similar investigation of the relationship between human capital and asset redeployability. As argued by Acharya et al. [2007], assets which are less redeployable should be less likely to be sold during times of industry distress due to market illiquidity. If human capital is related to greater redeployability, then the marginal effect of college share should be higher during times of industry distress. Defining distressed industries as those with median stock returns of -30% or below,[42] Table 10 presents results replicating specification (3) of Table 8 when splitting the sample by whether firms were in distressed industries in the year prior to entering bankruptcy.[43] I find that the marginal effect of college share on liquidation is twice as large for firms in distressed industries, although the difference in coefficients is insignificant.

To shed further light on these possible mechanisms, I next examine the post-bankruptcy performance of firms which emerge from Chapter 11. By comparing the relationships between human capital and outcomes within bankruptcy versus post-bankruptcy outcomes, I can distinguish between two different ways in which human capital impacts firm outcomes. If human-capital-intensive firms which enter bankruptcy are simply less viable overall compared with low-human-capital firms, then human capital should be correlated with higher post-bankruptcy refiling and liquidation rates and lower rates of continuation. However, if the selection process within bankruptcy is different for human-capital-intensive firms, then they could enjoy higher levels of continuation after emerging from bankruptcy despite their higher propensity for liquidation within bankruptcy.

[40] The industry unemployment rate is appropriate because departing workers are likely seek new jobs within the same industry (see Appendix A.5). However, the results are also consistent when using the overall unemployment rate.

[41] Results are similar if I compute the average unemployment rate during the period of bankruptcy for each firm.

[42] This definition is the same as that used in Section 4 above and analogous to that used by Acharya et al. [2007]

[43] Similar results obtain when measuring industry distress in the year of bankruptcy filing

6 Post-bankruptcy performance and survival for emerging firms

The post-bankruptcy survival of firms which emerge from bankruptcy can act as a test of whether the bankruptcy process results in over-continuation of firms which should be liquidated within Chapter 11. As documented by Hotchkiss [1995], a large fraction of firms which emerge from bankruptcy continue to perform worse than their industry peers, and many are liquidated or re-enter bankruptcy within five years of emergence. These results have been interpreted to suggest that pro-debtor biases in the bankruptcy process lead to the over-continuation of firms which should be shut down. Based on the results from the previous section, the extent of asset reallocation in bankruptcy may differ by human capital, but the specific channels for human capital's impact have different implications for post-bankruptcy outcomes.

If the higher liquidation rates for human-capital-intensive firms result only from the dissipation of going concern value due to human capital flight, then these firms would not be expected to fare better after bankruptcy compared with low-human-capital firms. Alternatively, if the higher liquidation rates documented in the previous section arise from greater asset redeployability, then human-capital-intensive firms may fare better conditional on emerging from bankruptcy due to the more stringent selection process within bankruptcy. To adjudicate between these possible relationships, I analyze post-bankruptcy performance and survival for the subset of 441 filings in which firms emerge from Chapter 11 as public companies, and I will present results for both profitability during the five years following emergence from bankruptcy and on post-bankruptcy firm survival.

Before I discuss my results for post-bankruptcy performance, an important note for comparison is that the operating performance for my sample of emerging firms is substantially better both before and after bankruptcy compared with those studied in Hotchkiss [1995]. While Hotchkiss [1995] finds that between 36 and 40 percent of emerging firms continue to experience negative operating income in the five years after emergence, this measure is between 19 percent and 24 percent in my sample.[44]

First, I consider whether human-capital-intensive firms improve their profitability at a faster rate after emerging from bankruptcy. In unreported results, I find that college share is associated with faster increases in profitability in the *emerged public* sample during the five after emerging from bankruptcy, although this relationship is insignificant. One issue with this analysis is that profitability can only be observed for surviving firms, while a major marker of poor performance is that firms drop out of the sample due to liquidation or refiling after initial emergence from bankruptcy. For more definitive evidence, I examine the outcomes among firms in the *emerged public* sample as of five years after emergence from bankruptcy. Of the 441 firms in my *emerged public* sample, 74 (17%) refile for Chapter 11 within five years of emergence, while 68 (15%) are acquired, and 4 (1%) are liquidated, and 26 (6%) have unknown outcomes. The overall rates of post-bankruptcy distress are somewhat lower in my sample than those studied previously. By comparison, Hotchkiss [1995] finds that 25 percent of firms re-enter distress through a private

[44]These differences are somewhat mitigated when I restrict my sample either to firms filing before 1989 (consistent with Hotchkiss's sample period) or restricting to firms with total assets less than $400 million. Within these subsamples, about 30 percent of firms continue to experience negative operating income in the five years after emergence. The remaining discrepancy is likely to result from sample selection; Hotchkiss [1995] supplements Compustat data with that collected from SEC filings, and it is likely that firms with missing data from Compustat have relatively lower operating performance.

restructuring, bankruptcy, or liquidation within five years of emergence. Lemmon et al. [2009] find that 32 percent of firms in their sample are acquired or re-file for bankruptcy within three years of emergence. While I focus on firm outcomes at the end of five years after initial emergence from bankruptcy, I obtain qualitatively similar results when varying the horizon after emergence between 3 and 7 years, and the results become stronger as the horizon increases.

The results corroborate the evidence from firm profitability discussed above that human-capital-intensive firms exhibit greater degrees of post-bankruptcy success. On a univariate basis, human-capital-intensive firms exhibit a greater probability of survival upon emergence from bankruptcy and a lower probability of refiling within five years. When splitting the *emerged public* sample by median college share, I find that high-college-share firms have a 67% likelihood of continuation, a 2% likelihood of liquidation, a 12% likelihood of refiling, and a 17% chance of being acquired as of five years after emerging from bankruptcy. In contrast, low-college-share firms have a 58% likelihood of continuation, a 1% likelihood of liquidation, a 26% likelihood of refiling, and a 16% chance of being acquired.

To analyze the relationship between post-bankruptcy outcomes and human capital on a multivariate basis, Table 11 presents results from multinomial logit regressions in which the dependent variable indicates the choice between the three possible post-bankruptcy outcomes, with continuation being the omitted category. Because very few firms are liquidated out of court subsequent to emergence, these two outcomes are collapsed into one category, which I call "failure". In specification (1), I confirm the univariate results by including only college share as a dependent variable in addition to the constant term. The results indicate that a one-standard-deviation increase in college share is associated with an eight percent reduction in the probability of post-bankruptcy failure.

To account for other variables which may be correlated with post-bankruptcy outcomes, specifications (2) and (3) include controls for log sales, leverage, and profitability measured in the fiscal year prior to bankruptcy filing.[45] In specification (2), the controls are added without the college share measure to establish a basis for comparison. Although the focus of my analysis is on the role of human capital, it is worth noting the patterns of results for outcomes within bankruptcy and post-bankruptcy outcomes for the control variables. If the liquidation decision within bankruptcy is made according to going concern value, the factors which are associated with liquidation within bankruptcy should also predict poor post-bankruptcy outcomes. Interestingly, the correlation between firm size and post-bankruptcy success has the opposite sign as for survival within bankruptcy (see Table 8), and its magnitude is economically significant. Evaluated at the means of the other variables, a one- standard-deviation increase in log sales is associated with an eight percent increase in the probability of failing within five years. Thus, the results may indicate that frictions in the bankruptcy process may favor the over-continuation of larger firms. Although leverage is also positively correlated with post-bankruptcy failure in contrast with its negative relationship with liquidation within bankruptcy, the coefficient is insignificant both economically and statistically. However, consistent with the idea that pre-bankruptcy profitability proxies for going concern value, this variable is negatively related both to liquidation within bankruptcy and post-bankruptcy failure. A one-standard-deviation increase in industry-adjusted profitability is associated with an eight percent decrease in the likelihood of post-bankruptcy failure.

Specification (3) shows that when both college share and the control variables are included in

[45] In unreported regressions, the results are similar when measuring controls in the first fiscal year after emergence from bankruptcy instead of prior.

the regression, the estimated effect of college share is slightly reduced but remains both economically and statistically significant. In this specification, a one-standard-deviation increase in college share is associated with a seven percent decline in the probability of post-bankruptcy failure. The marginal effects of the control variables also remain very similar to their levels from specification (2). Overall, the stability of the estimates in the three specifications indicates that the relationship between human capital and post-bankruptcy outcomes does not appear to be driven by its correlation with firm size, pre-bankruptcy leverage, or pre-bankruptcy profitability. Nonetheless, the results may still result from omitted variable bias, and I explore additional robustness checks in Section 8.

I now revisit my two main interpretations with respect to the observed relationship between college share and post-bankruptcy outcomes. Because higher levels of college share are associated with higher levels of liquidation at the resolution of bankruptcy yet lower failure rates upon emergence, the selection process within bankruptcy is likely to differ for these firms.[46] As discussed above, human capital flight may be one reason that human-capital-intensive are liquidated in bankruptcy. However, if employees depart from firms indiscriminately, then I should not observe lower post-bankruptcy failure rates. A more likely scenario is that employees choose to stay with firms which have higher continuation value, while hastening the liquidation of less viable firms. Hence, human capital flight may play a role not only in the overall liquidation rates of firms in bankruptcy, but in the differential selection of which firms emerge. Another reason that the selection process in bankruptcy may differ for human-capital-intensive firms is that their assets are more easily redeployed. Under this interpretation, only human-capital-intensive firms with relatively high continuation values would emerge from bankruptcy because the value of their assets under alternative uses is high. An important implication of both of these selection mechanisms is that the inefficient continuation of firms in the bankruptcy process appears to be less salient for human-capital-intensive firms.

7 Extension: general and firm-specific human capital

In this section, I re-examine my main results with the inclusion of employer tenure as a proxy for firm-specific human capital. The construction and justification of employer tenure is described in Section 3. When both college share and employer tenure are included in the specifications, I interpret college share as a proxy for general human capital, while employer tenure is likely to be more correlated with firm-specific human capital. However, it is important to note that employer tenure could be a proxy for omitted variables in addition to firm-specific human capital, so these results should be interpreted with caution.

The impact of general versus firm-specific human capital is likely to differ with respect to my two main interpretations for the relationship between human capital and the bankruptcy process. For example, it could be that human capital flight is less likely when employees possess greater levels of firm-specific as opposed to general human capital, since the value of their human capital is worth less to outside employers. Another possibility is that firm-specific human capital reduces the redeployability of a firm's assets through cospecialization between human and non-human assets. Although these are two plausible interactions, the distinct effects of general versus

[46] Otherwise, the higher liquidation rates would be indicate lower unobserved firm quality, leading to higher failure rates upon emergence.

firm-specific human capital remain empirical concerns. Thus, the following analysis can help shed additional light on the underlying mechanisms through with which human capital interacts with the bankruptcy process.

Table 12 examines the timing of bankruptcy relative to the onset of financial distress when both employer tenure and college share are included in specifications analogous to those in Table 5 (see Section 4 definitions of the onset of financial distress). The coefficients for college share are very similar to those in Table 5, suggesting that firm-specific human capital seems to have an independent relationship with the timing of bankruptcy above that of general human capital. Moreover, the coefficients on employer tenure are similar in specifications in which tenure is included alone without college share (unreported). The results indicate that higher levels of employer tenure are associated with longer periods of low interest coverage prior to bankruptcy; a one- standard-deviation increase in employer tenure is associated with a five month longer period of low interest coverage in both specifications (1) and (2). From specifications (3) and (4), employer tenure is also associated with longer delays in bankruptcy filing following low stock returns, although these results are not significant. Finally, from specification (5), I find that a one-standard-deviation increase in employer tenure is associated with a ten month decline in the delay between industry distress and bankruptcy filing. These results suggest that both general and firm-specific human capital are associated with longer periods of low interest coverage before bankruptcy and shorter periods to bankruptcy following industry distress.

Next, in Table 13 I examine the relationship between general and firm-specific human capital and changes in the levels of total debt, non-debt liabilities, assets, investments, and employment prior to bankruptcy in specifications analogous to those in Table 7. The coefficients for college share are very similar to those in Table 7, indicating that firms with higher levels of general human capital grow more aggressively in each of the dimensions I examine. In contrast, employer tenure is associated with greater declines along these dimensions.[47] The coefficients for employer tenure are generally negative for both unadjusted and industry-adjusted measures of the change in levels of each measure of firm scale, although the estimates for unadjusted levels are all insignificant or only marginally significant. Interestingly, while the coefficient for unadjusted changes in log employment in specification (9) is negative and significant at the ten percent level, this sign is reversed for the industry-adjusted measure of employment changes in specification (10) although the coefficient is insignificant. Thus, while firms with higher levels of firm-specific human capital are scaling back their operations more quickly overall, they seem more reluctant to undertake employment reductions relative to cutbacks in borrowing, the book value of assets, and capital expenditures.

In Table 14, I examine the relationships between general and firm-specific human capital, outcomes at the resolution of bankruptcy, and post-bankruptcy outcomes. In Specification (1), I examine outcomes within bankruptcy by replicating the third regression from Table 8 and adding the employer tenure measure. In specification (2), I conduct a similar exercise by replicating the results from the third regression in Table 11. First, I note that the effects for college share, log sales, leverage, and industry-adjusted profitability in both specifications are very similar to those without the employer tenure variable, indicating that employer tenure does not seem to drive the effects of the other variables. In both of the specifications, the results are also qualitatively similar if I exclude the control variables. From specification (1), I find that in contrast to the effect of college

[47]This pattern is consistent if college share is excluded from the specifications

share, the coefficient for employer tenure is negative and insignificant, with a marginal effect that is small in magnitude, indicating that firm-specific human capital is unrelated to the probability of liquidation in bankruptcy, but that the effects of general and firm-specific human capital contrast significantly. Specification (2) shows that for firms which emerge from bankruptcy, a one-standard-deviation increase in employer tenure is associated with a three percent decline in the probability of post-bankruptcy failure, with a coefficient that is significant at the ten percent level.

Overall, the analysis in this section indicates that firm-specific human capital seems to play a distinct role in the bankruptcy process compared with that of general human capital. I now evaluate the patterns in the bankruptcy process associated with employer tenure in light of the two interpretative frameworks I have discussed throughout this study: human capital flight and the relationship between human capital and asset redeployability.

First, I discuss the implications of my results with respect to human capital flight. Ex ante, it is unclear whether human capital flight should be a more important problem for firms with firm-specific or general human capital. While likelihood of human capital flight may be higher if employees have general human capital,[48] the value lost may be greater for firms with firm-specific human capital. My results show that while firms with higher levels of firm-specific human capital employ general cutbacks in firm scale, they seem relatively more reluctant to scale back employment than assets, borrowing, or capital expenditures. Furthermore, because employment reductions are coincident with general cutbacks, it is likely that separations generally occur because of layoffs initiated by firms rather than voluntary flight by employees. The insignificant and negative coefficient on employer tenure with respect to liquidation within bankruptcy is also consistent with the idea that human capital flight is less worrisome when human capital is firm-specific.

Next, I discuss how firm-specific human capital might relate to asset redeployability. Ceteris paribus, firms with higher levels of firm-specific human capital may have lower asset redeployability due to cospecialization between human and nonhuman assets. Firms with high levels of firm-specific human capital tend to involve sophisticated manufacturing processes (see Section 3), so these assets may be worth little to a buyer who intends to use them for another purpose. Another factor which impacts asset redeployability is that it may be more costly for firms with high firm-specific human capital to dismantle their workforce following asset sales.[49]

At first, the greater willingness of firms with firm-specific human capital to scale back their assets prior to bankruptcy seems inconsistent with the idea that their assets are less easily redeployed. However, a controlled reduction in firm size may be necessary to forestall bankruptcy (with its attendant risks of complete liquidation) in hopes that most of the firm would remain intact. Firms with high levels of firm-specific human capital may thus be strategically selling off non-core assets in order to maintain the viability of the firm as a whole. As argued by Shleifer and Vishny [1992], industry distress is particularly worrisome when assets have low redeployability since potential buyers are likely to be financially constrained, so the faster entry into bankruptcy associated with firm-specific human capital after industry distress may be related to the protection that bankruptcy can afford against asset fire-sales. Indeed, the negative (albeit insignificant) relationship between

[48] See Hall and Lazear [1984] and Hashimoto [1981]

[49] In order to incentivize workers to make the necessary investments in firm-specific human capital and to subsequently retain them, firms must promise sufficient long-term rewards which may include provisions for higher severance pay and benefits upon liquidation. Although these contracts are sometimes reneged upon or renegotiated during bankruptcy, employee claims are often a significant part of a firm's liabilities and are likely to be higher when firm-specific investments are important even after renegotiation.

employer tenure and liquidation within bankruptcy is tentative evidence firm-specific human capital is associated with lower redeployability. In a related paper, Alderson and Betker [1995] find that firms with higher liquidation costs emerge from Chapter 11 with capital structures that make re-entry into financial distress less likely. Under the hypothesis the firm-specific human capital is correlated with higher liquidation costs, my result that employer tenure is related to lower levels of post-bankruptcy failure is consistent with this previous finding.

The tentative results and discussion in this section provide some initial evidence that the distinction between general and firm-specific human capital makes a difference in the bankruptcy process. With respect to my two main interpretations, human capital flight seems to be a more important channel with respect to general human capital, while the relationship between human capital and asset redeployability seems to drive the results when firm-specific human capital is important.

8 Robustness checks

As I discussed in Section 3, the *college share* measure is likely to be correlated with differences in human-capital-intensity across industries. However, industries which differ by human capital are also likely to differ in other ways, leaving room for the results I've presented to be driven by omitted variables. In particular, firms with high college share tend to have more intangible assets, higher growth opportunities, and more R&D expenditures. In this Section, I explore how my main results are affected by considering the impact of potential omitted variables. In Subsection 8.1, I show that while human capital tends to act in the same direction as these potential confounds, my main results are robust to the inclusion of controls. In Subsection 8.2, I take a different approach to omitted variables by including fixed-effects for two-digit NAICS industries.

8.1 Additional controls

As proxies for intangibles and growth opportunities, I include median industry levels of tangibility (defined as PPE/book value), Q, and R&D expenditures / book value. For ease of exposition, I will refer to $intangibility$ in the following discussion and in the tables as the negative of tangibility. Tables 15, 16, 17 and 18 show results which replicate my main results with the inclusion of these controls. Because the value of assets and expenditures fluctuate considerably for firms approaching bankruptcy, industry-level measures are likely to be better proxies for the underlying importance of intangibles and growth opportunities than firm-level measures. However, in unreported results, my results are also robust to the inclusion of firm-level measures of intangibility, Q, and R&D.

In Table 15, I investigate the impact of controls for my results on the timing of bankruptcy by replicating the results from specifications (1) and (3) in Table 5. For the first set of regressions in columns (1) through (3), I define the onset of financial distress as the first of two years in which interest coverage falls below 1, or any year in which interest coverage falls below 0.8.[50] Consistent with my original findings, a one- standard-deviation increase in college share is still associated with a two to four month longer period of low interest coverage prior to bankruptcy in these specifications. Although the coefficient becomes insignificant with the inclusion of industry

[50] I find qualitatively similar results when defining low interest coverage as being in the bottom quartile within an industry.

R&D in specification (3), the coefficients are significant at the five percent level in both specifications (1) and (2). In addition, I find that similarly to college share, industry Q, intangibility, and $R\&D$ expenditures are positively correlated with the duration of low interest coverage prior to bankruptcy. A one- standard-deviation increase in each of these variables is associated with a one to four month longer delay prior to filing for bankruptcy. While the coefficient on $intangibility$ is insignificant, the coefficients on Q and $R\&D$ are significant at the five percent level. These results represent supportive evidence that the measure of delay I use captures a summary of the extent to which firms undertake actions such as those documented by Gilson et al. [1990] and Asquith et al. [1994] to forestall bankruptcy. As postulated by Gilson et al. [1990], firms with high Q (which they use as a measure of intangible assets) are more likely to delay bankruptcy through out-of-court restructuring because they have higher costs of liquidation.

In the second set of regressions in columns (4) through (6), I define the onset of financial distress as having annual stock returns at or below negative thirty percent.[51] Consistent with my main results, a one- standard-deviation increase in college share is associated with a two to four month shorter period between low returns and bankruptcy with the inclusion of controls, although the coefficient is marginally significant only in specification (6). In addition, I find that industry Q, intangibility and $R\&D$ expenditures have effects of the opposite sign as college share. A one-standard-deviation increase in each of these variables is associated with a two to five month *longer* delay between low returns and bankruptcy filing. While the coefficient on intangibility is marginally significant only at the ten percent level, the coefficients on Q and $R\&D$ are significant at the five and ten percent levels, respectively. Overall, these results provide solid evidence that the relationship between college share and the timing of bankruptcy is not driven solely by its correlation with intangible assets or growth potential.

In Table 16, I replicate the results in Table 7 for the changes in pre-bankruptcy asset size and employment with the addition of controls. The dependent variable in specifications (1) and (3) is the industry-adjusted change in log assets, while the dependent variable in specifications (4) through (6) is the industry-adjusted change in log employment. The main conclusion I highlight from these specifications is that the positive relationship between college share and changes in firm scale remains quite robust to the inclusion of the control variables.[52] The coefficient for college share is significant at the one percent level in three out of six specifications, and it become negative in only one specification. Furthermore, among the controls, only intangibility exhibits the same pattern in the sign of the effects as college share. Thus, the relationships I document between human capital and changes in firm scale prior to bankruptcy appear to be robust to the inclusion of the control variables.

In Table 17, I document the relationship between college share and firm outcomes in bankruptcy by including the additional controls in specification (3) of Table 8. Although it becomes insignificant or only marginally significant with the inclusion of the controls, the coefficient on college share remains positive in all specifications with a magnitude comparable to that without the inclusion of controls. Similar to college share, industry Q , intangibility, and $R\&D$ expenditures are all positively correlated with the probability of liquidation within bankruptcy. A one-standard-deviation increase in industry Q is associated with a three percent increase in liquidation rates, a

[51] Similar results obtain when defining low returns as being in the bottom quartile of an industry

[52] In unreported results, this conclusion remains consistent for analogous regressions using each of the dependent variables from Table 7.

one- standard-deviation increase in industry intangibility is associated with a five percent increase in liquidation rates, and a one-standard-deviation increase in industry R&D expenditures is associated with a less than one percent increase in liquidation rates. The results suggest that human capital has additional explanatory power beyond that of intangible assets and growth opportunities.

In Table 18, I document the relationship between college share and post-bankruptcy outcomes by including the additional controls in specification (3) of Table 11. In these results, the coefficient on college share remains positive in all specifications with a marginal effect comparable to that without the inclusion of controls. Similar to the results in Table 11, I find that a one-standard-deviation increase in college share is associated with a seven to nine percent decline in the probability of post-bankruptcy failure. In contrast to college share, industry Q and $R\&D$ expenditures are positively correlated with the probability of post-bankruptcy failure. A one-standard-deviation increase in industry Q is associated with an eight percent increase in failure rates, while a similar increase in industry R&D /book is associated with a three percent increase in post-bankruptcy failure. Among the three additional controls, only industry intangibility is correlated with post-bankruptcy failure in the same direction as college share. However, its marginal effect is small in magnitude and the coefficient is statistically insignificant.

Overall, the results in this section suggest that human capital has additional explanatory power beyond that of intangible assets and growth opportunities. While industry intangibility, Q, and R&D expenditures / book value are correlated with college share, the relationships between college share and the bankruptcy process which I document in my main results remain consistent when controlling for these variables. Furthermore, none of the three controls exhibits the same patterns in the signs of their effects throughout all of the analyses.

8.2 Within two-digit industries

Another technique for accounting for omitted variables which could be correlated with human capital is through two-digit industry fixed-effects. As described in Section 3, college share is constructed at the three-digit NAICS industry level, and industries which vary by college share are also different on a variety of other dimensions. Furthermore, the inclusion of proxies for omitted variables does not capture variation in *unobservable* dimensions, which can be accounted for by estimating industry fixed-effects. While college share varies at the level of the 92 three-digit NAICS industries, the two-digit NAICS groups industries into broader classifications. For instance, within the health care and social assistance industry (NAICS 62), nursing and residential care facilities (NAICS 623) have a college share of fifteen percent, while social assistance (NAICS 624) has a college share of thirty seven percent. A major drawback to this strategy is that the two-digit industries absorb much of the variation in human capital, so inclusion of industry fixed-effects significantly reduces the power of these tests.

In Table 19, I replicate the results from Table 5 with the inclusion of two-digit NAICS fixed-effects. Among the specifications, the only result which remains of similar magnitude and significance upon inclusion of fixed effects is specification (4), which measures the timing of bankruptcy after stock returns in the bottom quartile of an industry. As shown in specifications (1) and (2), the correlation between college share and the period of time between the onset of low interest coverage and bankruptcy filing remains positive, but the magnitude and significance of the coefficients are reduced dramatically. The correlation between college share and the period between low stock returns and bankruptcy in specification (3) reverses direction compared Table 5 and re-

mains insignificant. Similarly, the direction of the coefficient in specification (5) for the timing of bankruptcy after industry distress also reverses direction and becomes insignificant. Thus, the relationship between college share and the timing of bankruptcy is generally not robust to the inclusion of two-digit NAICS fixed-effects.

In Table 20, I replicate the specifications from Table 7 on the relationships between college share and changes in pre-bankruptcy debt, non-debt liabilities, assets, investment, and employment with the inclusion of two-digit NAICS fixed-effects. The results show evidence that the positive correlation between college share and growth in total debt, non-debt liabilities, the book value of assets, and capital expenditures prior to bankruptcy remain robust to the inclusion of fixed-effects. The coefficients on college share are positive in all specifications. Moreover, the coefficients on college share for the industry-adjusted measures in specifications (2), (4), (6), and (8) are of comparable magnitude to those in Table 7, and they are significant at the one percent level. However, the coefficients in the unadjusted measures in specifications (1), (3), (5), and (7) are insignificant in all specifications except one. From specifications (8) and (9), the correlation between college share and changes in employment prior to bankruptcy is rendered insignificant with the inclusion of two-digit industry fixed-effects.

Table 21 shows results for bankruptcy outcomes and post-bankruptcy outcomes with the inclusion of two-digit NAICS fixed-effects, replicating the specifications in column (3) of Tables 8 and 11.[53] Compared with the result from Table 8, the coefficient on college share in specification (1) with respect to liquidation within bankruptcy remains positive, but it becomes insignificant with the inclusion of fixed-effects and the marginal effect is reduced by 34 percent. The marginal effect of college share in the post-bankruptcy regression in specification (2) is reduced in magnitude by 79 percent compared to the result in Table 11, but it remains significant at the one percent level. Thus, while the magnitudes and significance of the effects for college share in the regressions are reduced, my main conclusions remain consistent in specifications that include two-digit industry fixed-effects.

9 Conclusion

This study presents an analysis of the role of human capital in the process of bankruptcy for a large sample of public companies that filed for Chapter 11 between 1980 and 2003. Using a measure of human capital intensity constructed from the Current Population Survey, I document several patterns in firm outcomes and behavior during the lead-up to bankruptcy, at the resolution of bankruptcy, and upon emergence from bankruptcy. Human-capital-intensive firms persist for a longer period with low interest coverage before filing for bankruptcy, but file faster following low stock returns and industry distress. Human-capital-intensive firms also exhibit more aggressive growth in borrowing, assets, investment, and employment compared with low-human-capital firms as they approach bankruptcy. They experience higher liquidation rates within bankruptcy and lower failure rates upon emergence. I show that these results are robust to a variety of different specifications as well as controls for several potential omitted variables and industry fixed-effects.

I propose two potential interpretations for the patterns I document. First, human capital flight may dissipate the going concern value of human-capital-intensive firms in bankruptcy, resulting

[53] Results are qualitatively similar for the other specifications in Tables 8 and 11

in their higher liquidation rates. Moreover, their lower post-bankruptcy failure rates are consistent with the possibility that human capital flight may lead to the selective liquidation of firms that are less economically viable. Second, it could be that the assets of human-capital-intensive firms are more readily redeployed, so they experience fewer liquidation costs and thus higher rates of liquidation within bankruptcy. Greater asset redeployability could also facilitate the liquidation of less-viable firms within bankruptcy. Both of these interpretations suggest that the growing importance of human capital may have implications for the effectiveness of Chapter 11 in asset allocation in the economy. While I present preliminary evidence that both channels may be at work, further research is necessary to more thoroughly examine the role of human capital in corporate bankruptcy.

A Data Appendix

A.1 Current Population Survey

I construct human capital measures using the Current Population Survey (CPS), which is a monthly survey conducted by the Bureau of the Census. To obtain a universe of workers relevant for Compustat firms, I restrict the CPS sample to workers in the private sector who are not self-employed. Because the CPS does not provide information on employer identities, I use industry classifications to construct proxies which can be matched to Compustat. In the CPS, the observations from 1981-1982 used the 1970 census industrial classification; those from 1983-1991 used the 1980 census industrial classification; those from 1992-2002 used the 1990 census industrial classification; and those from 2003-2004 used the 2000 census industrial classification. The 2000 census industrial classification is matched to the 2002 NAICS classification through crosswalks provided by the census bureau, and NAICS classifications are obtained for earlier census industries by using crosswalks to the 2000 classification. Through this process, each census industry is matched to a NAICS industry at the two to six-digit level. Using the resulting industry matches, I construct the *college share* and *employer tenure* measures for each two- and three-digit NAICS industry.[54]

A.2 College share

For the *college share* measure, I use the annual March supplement which has been extensively studied in the labor literature and includes about 100,000 individuals in each year, covering data on employment characteristics such as the earnings, industry, and occupation of each worker, as well as demographic characteristics such as age, sex, and ethnicity, and educational attainment. I obtain a consistent data series for the March supplement from the Integrated Public Use Microdata Series (IPUMS). I classify workers as college-educated if they have at least sixteen years of educational attainment. In each year t for each individual j, individual-level survey weights $w_{j,t}$ are provided in the CPS which represent the inverse probability of selection into the sample from the general population. Using these weights and the industry matching procedure described above, the college share measure for each three-digit NAICS industry i and year t is defined as

[54] Although the measures used in the analysis are at the three-digit level, two-digit measures are substituted when the census classification is matched at the two-digit NAICS level.

$$CollegeShare_{i,t} = \frac{\sum_{j \in i} w_{j,t} college_{j,t}}{\sum_{j \in i} w_{j,t}}$$

where $college_{j,t}$ is a dummy variable for college education for each worker. Each March survey describes individual characteristics for the previous calendar year, so I match each year t in Compustat to the CPS survey in year $t+1$. Thus, I used the surveys from 1981 to 2004 to construct the *college share* measure used in the analysis.

A.3 Employer tenure

Data on employer tenure are reported in the CPS mobility supplements from January 1981, 1983, 1987, 1991, 1996, 1998, 2000, and 2002 and the contingent and alternative employment arrangement supplements (CAEAS) in February 1995 and 1997. I obtain data from these supplements from UNICON and use the same year and industry conventions as for the *college share* measure described in the previous section. These supplements have been used in a substantial prior literature on employee tenure (Farber [1999], Jaeger and Stevens [1999], Farber [2007]).

The *employer tenure* variable measures the length of time an employee has worked for her current employer at the time of the survey, so it is important to note that this measure underestimates the length of completed employment spells. The survey question has also changed over time. In 1981, the survey question asked when the individual started working at her present job. From 1983 to 1991 1996, and 1998 to 2004, the survey question asked for the length of time the individual has worked continuously for her present employer. In 1995 and 1997, the survey question asked how long the individual has worked for her employer, without mention of the continuity of employment. Among these changes, the most substantial break occurred between the 1981 and subsequent surveys in the shifts from "job" to "employer" and from the date started to the length of time completed. However Jaeger and Stevens [1999] document that the tenure series remain stable across the two surveys as a result of the offsetting effects of the two questions.

I define the *employer tenure* measure for each three-digit NAICS industry i and year t as

$$EmployerTenure_{i,t} = \frac{\sum_{j \in i} w_{j,t} TenureVar_{j,t}}{\sum_{j \in i} w_{j,t}}$$

where $TenureVar_{j,t}$ is the response to the survey question described above for year t. For tenure measures taken from the displaced worker supplements in 1996, 1998, 2000, and 2002, $w_{j,t}$ is the displaced worker supplement weight. In other years, $w_{j,t}$ is the basic supplement weight.

A.4 Evidence from returns to college and tenure

In this section, I provide supporting evidence that the levels of college share and employer tenure across industries are indicative of difference in human capital by showing that they are correlated with higher *returns* to college and tenure, i.e. that employers reward these characteristics with higher wages.

To provide evidence that college shares are associated with higher returns to college education, I construct *college premium* for each industry i and year t as

$$CollegePremium_{i,t} = \frac{\sum_{j \in i} w_{j,t} AnnualIncome_{j,t} college_{j,t}}{\sum_{j \in i} w_{j,t} AnnualIncome_{j,t}(1 - college_{j,t})}$$

where as above, $w_{j,t}$ is individual j's sample weight, $AnnualIncome_{j,t}$ is j's total pre-tax wage and salary income during year $t-1$, and $college_{j,t}$ is a dummy variable for college education. Table 22 shows results from regressions of *college share* on *college premium* and fixed-effects for year and industry. The results show strong correlations between *college share* and *college premium*, so the industries with higher proportions of college-educated workers also provide greater compensation for the skills associated with college degrees. The R^2 of the regression of *college share* on *college premium* and a constant is 0.83. Although *college premium* shows a strong secular increase over time, the addition of year fixed-effects in the regression yields nearly identical results, indicating that cross-sectional differences in *college share* are also correlated with wage premia. When industry fixed-effects are added, both the coefficient on *college premium* and its significance decline by nearly one half, indicating that within-industry changes in *college share* are not as well-explained by variation in *college premium* as cross-sectional differences. Nonetheless, the correlation between *college share* and *college premium* are large and very highly significant in all specifications, providing strong evidence for the validity of the *college share* measure as a proxy for industry-level differences in human capital.

I conduct a similar exercise for employer tenure. For each industry i and year t, I run the following variation of the [Mincer, 1974] regression using OLS:

$$\begin{aligned} Log(WeeklyEarnings_j) = \beta^1 YearsSchooling_j + \beta^2 Experience_j + \beta^3 Experience_j^2 \\ + \beta^4 TenureVar_j + \epsilon_j \end{aligned}$$

where $WeeklyEarnings$ is the worker's usual gross earnings per week before taxes, $YearsSchooling$ is number of years of educational attainment, and $Experience$ is the standard proxy for potential work experience defined as $age - 6 - YearsSchooling$. The estimate $\hat{\beta}^4_{i,t}$ is then a measure of the return to tenure for industry i in year t. Using these estimates, I conduct regressions of *employer tenure* on the return to tenure for each industry and the ten years for which tenure data are available, and the results are shown in Table 23. The results show that the relationship between average employer tenure and returns to tenure are positive but insignificant.

A number of explanations could account for the insignificance of the relationship between levels of tenure and returns to tenure. First, because firm-specific human capital creates monopsony power for employers, the relationship between firm-specific human capital and wages is theoretically ambiguous. Although it is likely that firms do share some of the rents from firm-specific human capital with employees to encourage noncontractable investment and retention, monopsony power still dampens the wage-tenure relationship compared to the overall returns to firm-specific human capital. Secondly, because tenure accumulates at a fixed rate, changes in the technological returns to tenure are likely to be reflected slowly in actual tenure levels. Consistent with the latter explanation, the coefficient on returns to tenure are larger and more significant when year fixed-effects are included. Finally, as discussed in Section 3, tenure may be correlated with factors

unrelated to human capital. With these caveats in mind, the results in Table 23 shows evidence which is weakly consistent with the relationship between tenure and firm-specific human capital. For more conclusive evidence, I next turn to evidence form displaced workers as described below.

A.5 Evidence from displaced workers

In this section, I use evidence from workers involuntarily displaced from their jobs to provide supportive evidence for employer tenure as a measure of firm-specific human capital. I use data from the CPS displaced worker supplements from 1996, 1998, 2000, and 2002, and 2004, which identify workers who were displaced from their jobs in the previous three years due to operating decisions of the employer such as plant closings and position eliminations[55] and which also include information on educational attainment, age, and employer tenure. These supplements have been studied extensively in the prior literature which provides evidence for the relationship between tenure and firm-specific human capital.

Most workers experience wage declines after displacement, but if tenure is related to firm-specific human capital, then the size of the wage decline should be correlated with employer tenure, since the value of firm-specific human capital accumulated with tenure is destroyed upon displacement. The standard test of this hypothesis in the prior literature is to regress log wage declines on worker characteristics including education, experience, and tenure (Farber et al. [1993], Addison and Portugal [1989], Neal [1995]) and to examine the estimated coefficient on employer tenure.

I replicate these results using the CPS displaced worker supplements from 1996-2004. Following the literature, I consider only workers who obtained full-time jobs after displacement by the time of the survey in order to maintain comparability of wages. The results of the regressions are shown in Table 24. The results show that tenure is correlated with larger wage declines, and the result is statistically significant. Furthermore, as shown in specifications (2) through (4), displacement wage declines for highly-educated workers is driven by workers who switch industries or occupations after displacement.[56] However, wage declines are still correlated with employer tenure for workers who remain in their original industries and occupations. Thus, while different industries and occupations may provide different rewards for educational attainment (which would be consistent with heterogeneity in college shares), even workers who stay in their original industries and occupations suffer substantial wage declines which increase with pre-displacement tenure.

References

J. M. Abowd, J. Haltiwanger, R. Jarmin, J. Lane, P. Lengermann, K. McCue, K. McKinney, and K. Sandusky. The Relation Among Human Capital, Productivity, and Market Value. In M. M. Blair and T. A. Kochan, editors, *Measuring capital in the new economy*, pages 153–198. 2005.

D. Acemoglu and J. S. Pischke. Beyond Becker: Training in Imperfect Labour Markets. *The Economic Journal*, 109(453):112–142, 1999.

[55] Neither voluntary quits nor firing due to poor performance or other employee-specific reasons are considered displacements.

[56] Results are consistent when using a dummy for college education instead of years of education. However, this specification is not standard in the literature.

V. V. Acharya, S. T. Bharath, and A. Srinivasan. Does Industry-wide Distress Affect Defaulted Firms? Evidence from Creditor Recoveries. *Journal of Financial Economics*, 85(3):787–821, 2007.

J. T. Addison and P. Portugal. Job Displacement, Relative Wage Changes, and Duration of Unemployment. *Journal of Labor Economics*, pages 281–302, 1989.

M. J. Alderson and B. L. Betker. Liquidation Costs and Capital Structure. *Journal of Financial Economics*, 39(1):45–69, 1995.

E. I. Altman. Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance*, pages 589–609, 1968.

P. Asquith, R. Gertner, and D. Scharfstein. Anatomy of Financial Distress: An Examination of Junk-Bond Issuers. *Quarterly Journal of Economics*, 109(3):625–658, 1994.

D. H. Autor. Why do Temporary Help Firms Provide Free General Skills Training? *Quarterly Journal of Economics*, 116(4):1409–1448, 2001.

D. H. Autor, F. Levy, and R. J. Murnane. The Skill Content of Recent Technological Change: An Empirical Exploration. *Quarterly Journal of Economics*, 118(4):1279–1333, 2003.

D. G. Baird and R. K. Rasmussen. The End of Bankruptcy. *Stanford Law Review*, 55:751–790, 2002.

L. J. Bassi, B. Lev, J. Low, D. P. McMurrer, and G. A. Seisfeld. Measuring Corporate Investments in Human Capital. In M. M. Blair and T. A. Kochan, editors, *The New Relationship: Human Capital in the American Corporation*, pages 334–381. 2000.

G. S. Becker. Investment in Human Capital: A Theoretical Analysis. *The Journal of Political Economy*, 70(S5):9–49, 1962.

G. S. Becker. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. National Bureau of Economic Research, 1964.

Y. Ben-Porath. The Production of Human Capital and the Life Cycle of Earnings. *The Journal of Political Economy*, pages 352–365, 1967.

J. Berk, R. Stanton, and J. Zechner. Human Capital, Bankruptcy and Capital Structure. *NBER Working Paper*, 2007.

E. Berkovitch, R. Israel, and J. F. Zender. Optimal Bankruptcy Law and Firm-Specific Investments. *European Economic Review*, 41(3-5):487–497, 1997.

S. T. Bharath, V. Panchapagesan, and I. M. Werner. The Changing Nature of Chapter 11. *Mimeo, University of Michigan*, 2007.

M. Bradley and M. Rosenzweig. The Untenable Case for Chapter 11. *Yale Law Journal*, 101(5): 1043–1095, 1992.

D.T. Brown, C.M. James, and R.M. Mooradian. Asset Sales by Financially Distressed Firms. *Journal of Corporate Finance*, 1(2):233–257, 1994.

J.I. Bulow and J.B. Shoven. The Bankruptcy Decision. *Bell Journal of Economics*, 9(2):437–56, 1978.

D. K. Denis and K. J. Rodgers. Chapter 11: Duration, Outcome, and Post-Reorganization Performance. *Journal of Financial and Quantitative Analysis*, 42(1):101–118, 2007.

H. S. Farber. Mobility and Stability. *Handbook of Labor Economics*, 3:2441–2483, 1999.

H. S. Farber. *Job Loss and the Decline in Job Security in the United States*. 2007.

H. S. Farber, R. Hall, and J. Pencavel. The Incidence and Costs of Job Loss: 1982-91. *Brookings Papers on Economic Activity. Microeconomics*, pages 73–132, 1993.

R. Gertner and D. Scharfstein. A Theory of Workouts and the Effects of Reorganization Law. *Journal of Finance*, 46(4):1189–1222, 1991.

S.C. Gilson. Bankruptcy, Boards, Banks, and Bondholders: Evidence on Changes in Corporate Ownership and Control When Firms Default. *Journal of Financial Economics*, 27:355–388, 1990.

S.C. Gilson, K. John, and L. Lang. Troubled Debt Restructurings: an Empirical Study of Private Reorganization of Firms in Default. *Journal of Financial Economics*, 27:315–353, 1990.

R.E. Hall and E. Lazear. The Excess Sensitivity of Quits and Layoffs to Demand. *Journal of Labor Economics*, 2(2):233–257, 1984.

D. Hamermesh and G. Pfann. Two Sided Learning, Worker Turnover and Displacement. *NBER Working Paper*, 8273, 2001.

M. Hashimoto. Firm-Specific Human Capital as a Shared Investment. *American Economic Review*, 71(3):475–482, 1981.

E. S. Hotchkiss. Post-Bankruptcy Performance and Management Turnover. *Journal of Finance*, 50(1):3–21, 1995.

L. S. Jacobson, R. J. LaLonde, and D. G. Sullivan. Earnings Losses of Displaced Workers. *The American Economic Review*, pages 685–709, 1993.

D. A. Jaeger and A. H. Stevens. Is Job Stability in the United States Falling? Reconciling Trends in the Current Population Survey and Panel Study of Income Dynamics. *Journal of Labor Economics*, 17(S4):1–28, 1999.

D. W. Jorgenson, M. S. Ho, and K. J. Stiroh. Growth of US Industries and Investments in Information Technology and Higher Education. *Economic Systems Research*, 15(3):279–325, 2003.

B. Jovanovic. Job Matching and the Theory of Turnover. *The Journal of Political Economy*, 87 (5):972–990, 1979.

A. Kalay, R. Singhal, and E. Tashjian. Is Chapter 11 Costly? *Journal of Financial Economics*, 84 (3):772–796, 2007.

L. F. Katz and K. M. Murphy. Changes in Relative Wages, 1963-1987: Supply and Demand Factors. *Quarterly Journal of Economics*, 107(1):35–78, 1992.

L. F. Katz and L. H. Summers. Industry Rents: Evidence and Implications. *Brookings Papers on Economic Activity. Microeconomics*, pages 209–290, 1989.

M. L. Lemmon, Y. Y. Ma, and E. Tashjian. Survival of the Fittest? Financial and Economic Distress and Restructuring Outcomes in Chapter 11. *Unpublished working paper*, 2009.

P. A. Lengermann and L. Vilhuber. Abandoning the Sinking Ship: The Composition of Worker Flows Prior to Displacement. *Technical paper TP-2002-11, LEHD, US Census Bureau*, 2002.

L. M. LoPucki and W. C. Whitford. Corporate governance in the bankruptcy reorganization of large, publicly held companies. *University of Pennsylvania Law Review*, 141:669–2371, 1993.

V. Maksimovic and G. Phillips. Asset efficiency and reallocation decisions of bankrupt firms. *Journal of Finance*, pages 1495–1532, 1998.

J. Mincer. Schooling, Experience, and Earnings. Human Behavior & Social Institutions No. 2. 1974.

D. Neal. Industry-Specific Human Capital: Evidence from Displaced Workers. *Journal of Labor Economics*, pages 653–677, 1995.

D. O. Parsons. Specific Human Capital: An Application to Quit Rates and Layoff Rates. *The Journal of Political Economy*, pages 1120–1143, 1972.

T. C. Pulvino. Do Asset Fire Sales Exist? An Empirical Investigation of Commercial Aircraft Transactions. *The Journal of Finance*, 53(3):939–978, 1998.

T. C. Pulvino. Effects of Bankruptcy Court Protection on Asset Sales. *Journal of Financial Economics*, 52(2):151–186, 1999.

G. Schwerdt. Labor Turnover Before Plant Closure: 'Leaving the Sinking Ship' vs. 'Captain Throwing Ballast Overboard'. *Unpublished working paper*, 2008.

A. Shleifer and R.W. Vishny. Liquidation Values and Debt Capacity: A Market Equilibrium Approach. *Journal Of Finance*, 47:1343–1366, 1992.

R. Topel. Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority. *Journal of Political Economy*, pages 145–176, 1991.

L. A. Weiss. Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims. *Journal of Financial Economics*, 27:285–314, 1990.

I. Welch. Common Flaws in Empirical Capital Structure Research. *Working Paper*, 2008.

M.J. White. The Corporate Bankruptcy Decision. *Journal of Economic Perspectives*, 3(2):129–151, 1989.

L. Zingales. In Search of New Foundations. *Journal of Finance*, pages 1623–1653, 2000.

Table 1
Pre-bankruptcy firm characteristics by Chapter 11 outcome

The table presents firm characteristics in the last fiscal year prior to filing for Chapter 11 for 1493 filings between 1980 and 2003. The sample is divided into five outcomes at the resolution of Chapter 11. *Emerged public* indicates that an operating company emerged from Chapter 11 and was subsequently listed in the Compustat data set. *Emerged private* indicates that an operating company emerged from Chapter 11, but was not subsequently listed in Compustat. *Liquidated* indicates that the firm was sold piecemeal in a Chapter 11 liquidation or a conversion to Chapter 7. *Acquired* indicates that the majority of the firm's assets were acquired as a going concern by a single buyer. Firm outcomes are determined from the WebBRD, Bankruptcydata.com, court documents, and news searches. *Unknown* indicates firms whose outcomes could not be determined from these sources. ***,**,* denote that the difference in mean (median) characteristics between the outcome indicated and the sample of emerged firms (both public and private) is significant at the 0.01, 0.05, and 0.10 levels based on a t-test (Wilcoxon rank sum test).

	(1) Emerged public	(2) Emerged private	(3) Liquidated	(4) Acquired	(5) Unknown	(6) Full sample
Panel A: Number and proportion of filings by outcome						
Number of filings	441	267	566	159	60	1493
% of filings	30%	18%	38%	11%	4%	100%
Panel B: Mean (median) firm characteristics in year prior to Chapter 11 filing						
Sales ($MM)	926.34	953.06	359.17***	192.06**	491.79	613.92
	(289.87)	(127.66)	(94.52)***	(72.14)***	(35.99)***	(125.63)
Profitability	−0.23	−0.19	−0.18	−0.65	−0.16	−0.25
	(0.04)	(0.01)	(−0.03)***	(−0.03)***	(−0.06)***	(0.001)
Total debt / assets	0.94	0.75	0.54***	0.76	0.55	0.71
	(0.66)	(0.67)	(0.48)***	(0.53)**	(0.43)***	(0.55)
Total liabilities/ assets	1.53	1.17	0.93***	1.36	1.08	1.19
	(0.96)	(0.97)	(0.82)***	(0.86)***	(0.85)**	(0.88)
Interest coverage	−8.60	−7.44	−5.26	−10.54	−14.30	−7.56
	(0.57)	(0.24)	(−0.52)***	(−0.23)***	(−0.98)***	(0.04)
Panel C: Duration of Chapter 11						
Months in Chapter 11	16.87	17.01	21.74***	17.73	29.19***	19.19
	(13.00)	(13.93)	(15.98)***	(13.53)	(20.80)***	(14.33)

Table 2
Timing of bankruptcy and changes in profitability and leverage

The table presents sample statistics for 1493 public firms which file for bankruptcy between 1980 and 2003 during the ten years before they enter bankruptcy. The first column indicates the fiscal year relative to bankruptcy filing, where the filing year is year 0. The onset of financial distress is defined as the first of two years in which interest coverage falls below 1, or any year in which interest coverage falls below 0.8. Industry-adjusted profitability and leverage are calculated by subtracting the contemporaneous median among firms in the same three-digit NAICS industry in the Compustat database. Changes in profitability and leverage are measured between consecutive observations for each firm in the Chapter 11 sample. Contemporaneous median changes in profitability and leverage among Compustat firms in the same industries as Chapter 11 firms are presented in the last column of each panel.

Year	N	% in financial distress	Leverage (Liabilities/ assets)				Profitability (EBITDA / assets)			
			Median	Industry-adjusted median	Median change	Median change in industry	Median	Industry-adjusted median	Median change	Median change in industry
-10	633	20.5%	0.605	0.042			0.116	0.001		
-9	702	28.7%	0.607	0.051	0.003	−0.001	0.107	−0.003	−0.009	−0.003
-8	791	35.4%	0.617	0.056	0.005	−0.001	0.104	−0.011	−0.000	−0.001
-7	899	39.9%	0.633	0.068	0.008	−0.000	0.105	−0.006	0.001	−0.001
-6	1008	45.0%	0.640	0.081	0.008	0.001	0.097	−0.013	−0.007	−0.003
-5	1144	50.6%	0.663	0.098	0.013	0.003	0.085	−0.023	−0.005	−0.003
-4	1285	55.4%	0.684	0.107	0.021	0.004	0.076	−0.022	−0.006	−0.002
-3	1397	61.8%	0.707	0.129	0.027	0.005	0.063	−0.033	−0.007	−0.001
-2	1427	71.1%	0.769	0.188	0.057	0.006	0.037	−0.056	−0.023	−0.003
-1	1107	86.1%	0.933	0.343	0.152	0.006	−0.003	−0.091	−0.036	−0.003

Table 3
Industry composition and human capital measures

The table presents the number and percentage of firms in each two-digit NAICS industry 1493 public firms which file for Chapter 11 between 1980 and 2003. The percentage of firms in each industry in the full Compustat sample between 1980 and 2003 is also presented. Average college share and employer tenure for each industry are as defined in Section 3.

Industry	# Firms Ch 11 sample	% Firms Ch 11 sample	% Firms Compustat sample	College share	Employer tenure
Accommodation and Food Services	64	4.3%	3.2%	7.6%	4.1
Administrative and Support and Waste Management and Remediation Services	39	2.6%	3.8%	19.5%	4.4
Agriculture, Forestry, Fishing and Hunting	5	0.3%	0.6%	6.8%	6.7
Arts, Entertainment, and Recreation	15	1.0%	1.4%	18.2%	5.0
Construction	36	2.4%	2.5%	8.6%	5.6
Educational Services	5	0.3%	0.5%	54.8%	7.0
Food, Beverage, Tobacco, Textile, Apparel, and Leather Manufacturing	99	6.6%	5.7%	9.9%	8.5
Health Care and Social Assistance	61	4.1%	2.9%	27.7%	5.9
Information	204	13.7%	16.4%	31.2%	7.8
Metal, Machinery, Electronics, Transportation, and Miscellaneous Manufacturing	354	23.7%	30.2%	19.2%	9.3
Mining	73	4.9%	7.8%	20.9%	9.0
Other Services (except Public Administration)	7	0.5%	0.8%	15.4%	5.7
Postal Service, Warehousing	5	0.3%	0.3%	9.2%	6.1
Professional, Scientific, and Technical Services	43	2.9%	7.7%	48.9%	5.3
Public Administration	1	0.1%	0.0%		
Real Estate and Rental and Leasing	39	2.6%	4.5%	22.7%	5.0
Retail trade in Motor Vehicles, Furnishings, Electronics, Building Materials, Food, Personal Care	118	7.9%	3.8%	11.1%	5.8
Retail trade, General and Miscellaneous	81	5.4%	3.1%	13.2%	5.8
Transportation and Warehousing	63	4.2%	3.4%	13.0%	8.5
Wholesale Trade	75	5.0%	6.2%	22.1%	7.0
Wood product, Petroleum, Chemical, Plastics, and Nonmetallic Mineral Product Manufacturing	106	7.1%	13.1%	18.7%	9.5
Total	1493	100.0%	100.0%	19.8%	7.5

Table 4
Correlations between human capital and firm characteristics

The table presents correlations between college share, employer tenure, and firm characteristics averaged within the 70 three-digit NAICS industries represented in a sample of 1493 Chapter 11 filings by public firms between 1980 and 2003. Average college share and employer tenure for each industry are as defined in Section 3. Equally-weighted means for firms in each industry are calculated for *Q*, *tangibility*, *leverage*, *R&D/book*, and *profitability* measured two fiscal years before filing. *Q* is defined as (book value of assets + market value of common equity - book value of equity - book value of deferred taxes) / book value of assets. *tangibility* is defined as net property, plants and equipment (PPE) / book value of assets. *leverage* is defined total liabilities / total assets. *R&D/book* is R&D expenses / total assets. *profitability* is EBITDA / total assets.

Variables	College share	Employer tenure	Log sales	Q	Tang	Leverage	R&D/book	Prof
College share	1.000							
Employer tenure	−0.120	1.000						
Log sales	−0.342	0.243	1.000					
Q	0.217	−0.032	−0.413	1.000				
Tangibility	−0.078	0.138	0.109	−0.161	1.000			
R&D/book	0.268	−0.063	−0.616	0.686	−0.243	1.000		
Leverage	−0.031	0.013	0.012	0.311	0.028	−0.112	1.000	
Profitability	−0.114	0.115	0.372	−0.831	0.245	−0.561	−0.172	1.000

Table 5
OLS regressions relating the timing of distress to human capital

The table presents estimates for the relationship between *college share* and the timing of bankruptcy for 1493 public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *college share*. The dependent variables are the number of years between distress onset (within the ten years prior to bankruptcy) and bankruptcy filing. Each specification contains one observation for each firm in the sample that has entered distress by that measure at the time of bankruptcy. In specification (1), the onset of financial distress is defined as the first of two years in which interest coverage falls below 1, or any year in which interest coverage falls below 0.8. In the remaining specifications, distress onset for a firm is defined as (2) having interest coverage below the 25th percentile within its industry, (3) having annual stock returns of -30% or lower, (4) having annual stock returns below the 25th percentile within an industry, and (5) being in an industry whose median annual stock return is -30% or lower. T statistics are presented in brackets. Standard errors are clustered at the industry level.

	(1) Low interest coverage	(2) Interest coverage $\leq$ p25 in industry	(3) Stock return $\leq$ -30%	(4) Stock return $\leq$ p25 in industry	(5) Median industry return $\leq$ -30%
College share	3.03	2.15	-0.91	-2.02	-7.15
	$[4.11]***$	$[2.18]*$	$[-0.74]$	$[-2.24]*$	$[-4.53]***$
Constant	3.95	4.64	4.63	5.20	5.46
	$[23.73]***$	$[18.11]***$	$[17.31]***$	$[19.98]***$	$[9.29]***$
Observations	1140	1063	931	915	747
R-square	0.012	0.0054	0.0012	0.0050	0.075

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
OLS regressions relating the rates of change in profitability and leverage to human capital

The table presents estimates of correlations between *college share* and the rates of change in profitability and leverage prior to bankruptcy for 1493 public firms that file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *college share*. The dependent variables are year-to-year changes in profitability and leverage during the ten years prior to bankruptcy. *Profitability* is defined as EBITDA divided by the book value of assets. *Leverage* is defined total liabilities divided by total assets. Industry-adjusted measures are calculated by subtracting the contemporaneous median of the dependent variable among firms in the same three-digit NAICS industry in the Compustat database. Dependent variables are winsorized at the 5% level. The specifications include fixed-effects for normalized year, which represents the observation year ranging relative to the year of bankruptcy filing. T statistics are presented in brackets, and standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)
	Change in profitability		Change in leverage	
	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted
College share	-0.0057	-0.0072	0.065	0.066
	$[-0.36]$	$[-0.47]$	$[2.66]**$	$[2.73]**$
Observations	8118	8118	8241	8241
R-square	0.027	0.022	0.11	0.10
Normalized year FE	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7
OLS regressions relating pre-bankruptcy changes in firm scale to human capital

The table presents estimates of correlations between *college share* and pre-bankruptcy changes in total debt, non-debt liabilities (total liabilities minus the book values of short-term and long-term debt), the book value of assets, capital expenditures, and total employment for 1493 public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *college share*. The dependent variable in each specification is the change in log levels of each measure from year to year. In the second specification in each pair, the dependent variable is adjusted for industry-level variation by subtracting its contemporaneous median among firms in the same three-digit NAICS industry. Norm year represents the observation year relative to bankruptcy filing, where the year of filing is 0. T statistics are presented in brackets, and standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total debt		Non-debt liabilities		Book value		Capital expenditures		Employment	
	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted
College share	0.71	1.12	0.59	2.96	0.58	6.36	0.62	1.09	0.24	0.35
	[6.44]***	[3.26]**	[7.38]***	[6.00]***	[6.72]***	[4.49]***	[5.76]***	[4.97]***	[3.39]***	[4.72]***
Observations	7699	7699	8205	8205	8257	8257	7875	7875	7540	7540
R-square	0.059	0.073	0.12	0.32	0.11	0.40	0.040	0.072	0.038	0.023
Normalized year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table 8
Multinomial logit regressions relating bankruptcy outcomes to human capital

The table presents estimates of the relationship between *college share* and bankruptcy outcomes from multinomial logit regressions of firm outcomes at the resolution of Chapter 11 for firms which filed between 1980 and 2003. See Section 3 for definition of *college share*. The dependent variable indicates whether the firm emerges from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. Covariates are measured in the fiscal year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, subtracted by the contemporaneous median value within each firm's three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)		(3)	
	Liquidated	Acquired	Liquidated	Acquired	Liquidated	Acquired
College share	0.474	0.090			0.324	0.023
	[3.45]***	[1.57]			[2.07]**	[0.34]
Log sales			−0.0170	−0.0168	−0.011	−0.016
			[1.79]*	[4.13]***	[1.08]	[3.55]***
Leverage			−0.283	−0.001	−0.281	−0.002
			[4.95]***	[0.03]	[4.91]***	[0.06]
Ind-adj profitability			−0.222	0.043	−0.233	0.041
			[3.28]***	[1.14]	[3.26]***	[1.06]
Constant	−0.089	−0.156	0.312	−0.051	0.214	−0.057
	[2.82]***	[13.22]***	[5.38]***	[1.62]	[2.80]***	[1.29]
Observations	1424	1424	1409	1409	1409	1409
Log Likelihood	-1354.82		-1301.05		-1297.44	
Pseudo R2	0.01		0.04		0.04	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9
Multinomial logit regressions relating bankruptcy outcomes to human capital for high and low unemployment levels

The table presents estimates from multinomial logit regressions of firm outcomes at the resolution of Chapter 11 for firms which filed between 1980 and 2003. The unemployment rate is calculated for each three-digit NAICS industry for civilians aged 25 through 54, then subtracted by the average unemployment rate within each industry for the period between 1980 and 2003. The specifications show regressions in which the sample is split by the median unemployment rate in the year prior to filing. The dependent variable indicates whether the firm emerges from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. Covariates are measured in the fiscal year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, subtracted by the contemporaneous median value within each firm's three-digit NAICS industry. Log sales, industry-adjusted profitability, and leverage are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)	
	Low unemployment		High unemployment	
	Liquidated	Acquired	Liquidated	Acquired
College share	0.451	0.087	0.290	−0.082
	[2.54]**	[0.87]	[1.26]	[0.78]
Log sales	0.005	−0.010	−0.032	−0.023
	[0.37]	[1.82]*	[2.39]**	[3.34]***
Leverage	−0.319	−0.029	−0.226	0.016
	[4.12]***	[0.59]	[3.58]***	[0.44]
Industry-adjusted profitability	−0.199	0.049	−0.243	0.014
	[2.06]**	[0.85]	[2.27]**	[0.25]
Constant	0.197	−0.068	0.218	−0.029
	[1.76]*	[1.23]	[2.11]**	[0.47]
Observations	713	713	696	696
Log Likelihood	-641.85		-639	
Pseudo R2	0.04		0.05	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10
Multinomial logit regressions relating bankruptcy outcomes to human capital for distressed and non-distressed industries

The table presents estimates from multinomial logit regressions of firm outcomes at the resolution of Chapter 11 for firms which filed between 1980 and 2003. The sample is split by whether industries were in distress in the year prior to filing, where industry distress is defined as having median stock returns of -30% or lower. The dependent variable indicates whether the firm emerges from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. Covariates are measured in the fiscal year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, subtracted by the contemporaneous median value within each firm's three-digit NAICS industry. Log sales, industry-adjusted profitability, and leverage are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)	
	No industry distress		Industry distress	
	Liquidated	Acquired	Liquidated	Acquired
College share	0.251	0.030	0.515	0.082
	[1.39]	[0.41]	[1.68]*	[0.50]
Log sales	−0.015	−0.020	0.001	−0.001
	[1.46]	[3.97]***	[0.04]	[0.18]
Leverage	−0.292	0.009	−0.246	−0.043
	[4.32]***	[0.26]	[2.71]***	[0.74]
Industry-adjusted profitability	−0.175	0.056	−0.444	−0.023
	[2.53]**	[1.29]	[2.79]***	[0.27]
Constant	0.258	−0.050	0.070	−0.113
	[3.23]***	[0.98]	[0.46]	[1.77]*
Observations	1164	1164	245	245
Log Likelihood	-1077.75		-215.48	
Pseudo R2	0.04		0.06	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11
Multinomial logit regressions relating post-bankruptcy outcomes to human capital

The table presents estimates for the relationship between *college share* and post-bankruptcy outcomes from multinomial logit regressions of firm outcomes at the resolution of Chapter 11 for firms which filed between 1980 and 2003 and subsequently emerged as public companies. The dependent variable indicates whether the firm is continuing as an independent entity, refiled for bankruptcy, was liquidated out of court, or was acquired as of five years after emergence from Chapter 11, with continuation as the omitted category. See Section 3 for the definition of *college share*. Covariates are measured in the year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, adjusted by its median value within a three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)		(3)	
	Refiled/Liq	Acquired	Refiled/Liq	Acquired	Refiled/Liq	Acquired
College share	-0.734	0.024			-0.632	0.088
	$[2.99]***$	$[0.09]$			$[2.84]***$	$[0.32]$
Log sales			0.042	0.014	0.033	0.015
			$[3.35]***$	$[1.42]$	$[2.52]**$	$[1.39]$
Leverage			0.022	0.129	0.041	0.128
			$[0.25]$	$[1.69]*$	$[0.48]$	$[1.78]*$
Industry-adjusted profitability			-0.363	0.164	-0.333	0.160
			$[3.00]***$	$[1.26]$	$[2.62]***$	$[1.17]$
Constant	-0.011	-0.154	-0.435	-0.335	-0.285	-0.360
	$[0.23]$	$[3.21]***$	$[3.35]***$	$[3.27]***$	$[2.00]**$	$[2.63]***$
Observations	395	395	391	391	391	391
Log Likelihood	-351.68		-339.42		-335.85	
Pseudo R2	0.02		0.03		0.04	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12
OLS regressions relating the timing of bankruptcy to general and firm-specific human capital

The table presents estimates for the relationship between *college share*, *employer tenure*, and the timing of bankruptcy for 1493 public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definitions of *college share* and *employer tenure*. The dependent variables are the number of years between distress onset (within the ten years prior to bankruptcy) and bankruptcy filing for each firm in the sample, conditional upon having entered distress by that measure at the time of bankruptcy. In specification (1), the onset of financial distress is defined as the first of two years in which interest coverage falls below 1, or any year in which interest coverage falls below 0.8. In the remaining specifications, distress onset for a firm is defined as (2) having interest coverage below the 25th percentile within its industry, (3) having annual stock returns below -30%, (4) having annual stock returns below the 25th percentile within an industry, and (5) being in an industry whose median annual stock return is -30% or lower. T statistics are presented in brackets. Standard errors are clustered at the industry level.

	(1) Low interest coverage	(2) Interest coverage $\leq$ p25 in industry	(3) Stock return $\leq$ -30%	(4) Stock return $\leq$ p25 in industry	(5) Median industry return $\leq$ -30%
Employer tenure	0.18	0.18	0.064	0.13	−0.38
	[5.68]***	[6.73]***	[0.97]	[2.02]	[−4.81]***
College share	3.21	2.18	−0.82	−1.91	−7.59
	[5.09]***	[2.60]*	[−0.70]	[−2.19]*	[−4.18]***
Constant	2.56	3.23	4.13	4.21	8.24
	[9.13]***	[10.64]***	[8.04]***	[8.01]***	[8.18]***
Observations	1140	1063	931	915	747
R-square	0.029	0.024	0.0039	0.014	0.16

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13
OLS regressions relating pre-bankruptcy changes in firm scale to general and firm-specific human capital

The table presents estimates for 1493 public firms between 1980 and 2003 of the relationships between *college share*, *employer tenure*, and changes in total debt, non-debt liabilities (total liabilities minus the book values of short-term and long-term debt), the book value of assets, capital expenditures, and total employment. See Section 3 for the definitions of *college share* and *employer tenure.* In the second specification in each pair, the dependent variable is adjusted for industry by subtracting its contemporaneous median among firms in the same three-digit NAICS industry. Norm year represents the observation year relative to bankruptcy filing, where the year of filing is 0. T statistics are presented in brackets. Standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total debt		Non-debt liabilities		Book value		Capital expenditures		Employment	
	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted
Employer tenure	−0.0064	−0.14	−0.0028	−0.12	−0.0049	−0.35	−0.0037	−0.054	−0.0069	0.0059
	[−1.51]	[−6.03]***	[−0.81]	[−4.84]***	[−1.33]	[−4.26]***	[−0.78]	[−4.39]***	[−2.17]*	[1.82]
College share	0.71	1.07	0.59	2.89	0.57	6.18	0.61	1.06	0.24	0.35
	[6.42]***	[3.03]**	[7.37]***	[5.72]***	[6.70]***	[4.24]***	[5.75]***	[4.68]***	[3.34]***	[4.79]***
Observations	7699	7699	8205	8205	8257	8257	7875	7875	7540	7540
R-square	0.059	0.090	0.12	0.33	0.11	0.40	0.040	0.076	0.039	0.024
Norm year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 14
Multinomial logit regressions relating bankruptcy and post-bankruptcy outcomes to general and firm-specific human capital

The table presents estimates from multinomial logit regressions of the relationships between *college share* and *employer tenure* and firm outcomes at the resolution of bankruptcy and after emergence from bankruptcy. See Section 3 for definitions of *college share* and *employer tenure*. The dependent variable in specification (1) indicates whether the firm emerged from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. The dependent variable in specification (2) indicates whether the firm was continuing as an independent entity, refiled for bankruptcy or was liquidated out of court, or was acquired as of five years after emergence from Chapter 11, with continuation as the omitted category. Covariates are measured in the year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, adjusted by its median value within a three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)	
	Bankruptcy		Post-bankruptcy	
	Liquidated	Acquired	Refiled/Liquidated	Acquired
Employer tenure	−0.0034	0.0008	−0.0147	0.0079
	[0.49]	[0.29]	[1.82]∗	[0.51]
College share	0.309	0.024	−0.475	0.032
	[1.87]∗	[0.34]	[2.50]∗∗	[0.13]
Log sales	−0.012	−0.017	0.036	0.014
	[1.20]	[3.67]∗∗∗	[2.85]∗∗∗	[1.34]
Leverage	−0.284	−0.006	0.039	0.116
	[5.07]∗∗∗	[0.20]	[0.47]	[1.61]
Industry-adjusted profitability	−0.232	0.039	−0.336	0.162
	[3.30]∗∗∗	[1.04]	[2.83]∗∗∗	[1.21]
Constant	0.246	−0.059	−0.203	−0.394
	[2.37]∗∗	[1.07]	[1.27]	[1.82]∗
Observations	1414	1414	392	392
Log Likelihood	-1302.12		-337.27	
Pseudo R2	0.04		0.05	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 15
OLS regressions relating the timing of bankruptcy to human capital, with controls

The table presents estimates for the relationship between human capital and the timing of bankruptcy relative to the onset of distress for bankruptcy filings by 1493 public firms between 1980 and 2003. See Section 3 for the definition of *college share*. The dependent variables are the number of years between distress onset (within the ten years prior to bankruptcy) and bankruptcy filing for each firm in the sample, conditional upon having entered distress by that measure at the time of bankruptcy. In specifications (1) through (3), the onset of distress is defined as the first of two years in which interest coverage falls below 1, or any year in which interest coverage falls below 0.8. In specifications (4) through (6), the onset of distress is defined as having stock returns at or below -30%. Industry medians of Q ((book value of short-term and long-term debt + market value of equity)/ book value of assets), intangibility (-PPE/book value), and R&D expenditures / book value are calculated among firms in the same three-digit NAICS industry in the Compustat database. T statistics are presented in brackets. Standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Years in distress Low interest coverage			Years in distress Stock return $\leq$ -30%		
College share	2.11	2.69	1.68	−2.38	−1.53	−2.85
	[2.85]**	[3.70]**	[2.03]	[−1.65]	[−1.20]	[−2.36]*
Ind med Q	0.47			0.7		
	[3.55]**			[3.50]**		
Ind med intangibility		0.62			1.08	
		[1.18]			[2.65]*	
Ind med R&D/book			6.15			9.24
			[2.83]**			[4.40]***
Constant	3.47	4.22	4.05	3.94	5.1	4.77
	[15.9]***	[17.1]***	[24.6]***	[12.5]***	[16.1]***	[17.9]***
Observations	1140	1140	1140	931	931	931
R-square	0.017	0.013	0.018	0.012	0.0062	0.017

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 16
OLS regressions relating pre-bankruptcy changes in firm scale to human capital, with controls

The table presents estimates of the relationships between *college share* and the rate of change in the book value of assets and total employment prior to bankruptcy for public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *college share*. In specifications (1) through (3), the dependent variable is the year-to-year change in log book assets. In specifications (4) through (6), the dependent variable is the year-to-year change in log employment. The dependent variables are adjusted for industry by subtracting their contemporaneous medians among firms in the same three-digit NAICS industry. Industry medians of Q ((book value of short-term and long-term debt + market value of equity)/ book value of assets), intangibility (-PPE/book value), and R&D expenditures / book value are calculated among firms in the same three-digit NAICS industry in the Compustat database. Norm year represents the observation year relative to bankruptcy filing, where the year of filing is 0. T statistics are presented in brackets. Standard errors are clustered at the industry level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in log book assets			Change in log employment		
College share	12.1	3.16	−1.37	0.15	0.34	0.39
	[7.88]***	[2.01]*	[−0.71]	[1.90]	[4.42]***	[4.51]***
Ind med Q	−2.5			0.093		
	[−8.75]***			[6.35]***		
Ind med intangibility		6.59			0.0072	
		[6.49]***			[0.27]	
Ind med R & D / book			36.7			−0.21
			[5.11]***			[−1.34]
Observations	8257	8257	8255	7540	7540	7538
R-square	0.41	0.41	0.42	0.03	0.023	0.024
Norm year FE	yes	yes	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 17
Multinomial logit regressions relating bankruptcy outcomes to human capital, with controls

The table presents estimates from multinomial logit regressions of firm outcomes at the resolution of Chapter 11 for firms which filed between 1980 and 2003. The dependent variable indicates whether the firm emerged from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. Covariates are measured in the fiscal year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, adjusted by its median value within a three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Industry medians of Q ((book value of short-term and long-term debt + market value of equity)/ book value of assets), intangibility (-PPE/book value), and R&D expenditures / book value are calculated among firms in the same three-digit NAICS industry in the Compustat database. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the industry level.

	(1)		(2)		(3)	
	Liquidated	Acquired	Liquidated	Acquired	Liquidated	Acquired
College share	0.2244	−0.0106	0.1710	0.0226	0.3183	0.0067
	[1.15]	[0.15]	[1.05]	[0.32]	[1.82]∗	[0.09]
Log sales	−0.010	−0.016	−0.013	−0.017	−0.011	−0.016
	[0.93]	[3.40]∗∗∗	[1.45]	[3.54]∗∗∗	[1.06]	[3.49]∗∗∗
Leverage	−0.275	−0.000	−0.258	−0.002	−0.281	−0.001
	[4.73]∗∗∗	[0.01]	[4.75]∗∗∗	[0.07]	[4.91]∗∗∗	[0.05]
Ind-adj profitability	−0.232	0.042	−0.194	0.041	−0.234	0.042
	[3.21]∗∗∗	[1.07]	[2.84]∗∗∗	[1.02]	[3.26]∗∗∗	[1.08]
Ind med Q	0.058	0.019				
	[1.78]∗	[1.73]∗				
Ind med intangibility			0.314	−0.000		
			[4.08]∗∗∗	[−0.01]		
Ind med R&D/book					0.029	0.071
					[0.11]	[0.83]
Constant	0.142	−0.081	0.336	−0.057	0.214	−0.057
	[1.69]∗	[1.57]	[4.36]∗∗∗	[1.23]	[2.80]∗∗∗	[1.28]
Observations	1409	1409	1409	1409	1409	1409
Log Likelihood	-1294.87		-1287.97		-1297.31	
Pseudo R2	0.04		0.05		0.04	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 18
Multinomial logit regressions relating post-bankruptcy outcomes to human capital, with controls

The sample consists of public firms which filed between 1980 and 2003 and subsequently emerged from bankruptcy as public companies. The dependent variable indicates whether the firm was continuing as an independent entity, refiled for bankruptcy or was liquidated out of court, or was acquired as of five years after emergence from Chapter 11, with continuation as the omitted category. Covariates are measured in the year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, adjusted by its median value within a three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Industry medians of Q ((book value of short-term and long-term debt + market value of equity)/ book value of assets), intangibility (-PPE/book value), and R&D expenditures / book value are calculated among firms in the same three-digit NAICS industry in the Compustat database. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets.

	(1)		(2)		(3)	
	Refiled/Liq	Acquired	Refiled/Liq	Acquired	Refiled/Liq	Acquired
College share	−0.8469	−0.0933	−0.6167	0.1205	−0.7277	0.3388
	[3.36]***	[0.38]	[2.73]***	[0.44]	[2.91]***	[1.04]
Log sales	0.038	0.018	0.033	0.017	0.034	0.015
	[2.87]***	[1.47]	[2.48]**	[1.45]	[2.58]***	[1.38]
Leverage	0.030	0.109	0.040	0.130	0.034	0.151
	[0.36]	[1.57]	[0.47]	[1.80]*	[0.40]	[2.05]**
Ind-adj profitability	−0.315	0.159	−0.340	0.139	−0.336	0.155
	[2.48]**	[1.19]	[2.59]***	[0.97]	[2.64]***	[1.11]
Ind med Q	0.151	0.123				
	[2.80]***	[1.84]*				
Ind med intangibility			−0.052	−0.110		
			[−0.60]	[−0.99]		
Ind med R&D/book					0.577	−1.626
					[1.03]	[1.11]
Constant	−0.454	−0.482	−0.310	−0.418	−0.280	−0.394
	[3.22]***	[2.63]***	[1.85]*	[2.60]***	[1.94]*	[2.96]***
Observations	391	391	391	391	391	391
Log Likelihood	-330.29		-334.92		-332.94	
Pseudo R2	0.06		0.05		0.05	

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 19
OLS regressions relating the timing of distress to human capital, with two-digit NAICS fixed-effects

The table presents estimates for the relationship between *college share* and the timing of bankruptcy for 1493 public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *College share*. The dependent variables are the number of years between distress onset (within the ten years prior to bankruptcy) and bankruptcy filing for each firm in the sample, conditional upon having entered distress by that measure at the time of bankruptcy. In the remaining specifications, distress onset for a firm is defined as (2) having interest coverage below the 25th percentile within its industry, (3) having annual stock returns below -30%, (4) having annual stock returns below the 25th percentile within an industry, and (5) being in an industry whose median annual stock return is -30% or lower. Each specification includes fixed-effects for industries at the two-digit NAICS level. T statistics are presented in brackets. Standard errors are clustered at the three-digit industry level.

	(1) Low interest coverage	(2) Interest coverage $\leq$ p25 in industry	(3) Stock return $\leq$ -30%	(4) Stock return $\leq$ p25 in industry	(5) Median industry return $\leq$ -30%
College share	0.24	0.36	0.19	-3.03	1.24
	[0.23]	[0.26]	[0.12]	$[-2.68]*$	[0.58]
Constant	4.23	4.65	5.24	4.96	4.92
	$[2.83]**$	$[2.51]*$	$[3.84]***$	$[3.17]**$	$[36.61]***$
Observations	1140	1063	931	915	747
R-square	0.055	0.039	0.043	0.050	0.23
2-digit NAICS FE	yes	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 20
OLS regressions relating pre-bankruptcy changes in firm scale to human capital, with two-digit NAICS fixed-effects

The table presents estimates of the correlation between human capital and changes in total debt, non-debt liabilities (total liabilities minus the book values of short-term and long-term debt), the book value of assets, capital expenditures, and total employment for 1493 public firms which file for bankruptcy between 1980 and 2003. See Section 3 for the definition of *College share*. The dependent variable in each specification is the change in log levels of each variable from year to year. In the second specification in each pair, the dependent variable is adjusted for industry by subtracting its contemporaneous median among firms in the same three-digit NAICS industry. Norm year represents the observation year relative to bankruptcy filing, where the year of filing is 0. T statistics are presented in brackets. Standard errors are clustered at the three-digit industry level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total debt		Non-debt liabilities		Book value		Capital expenditures		Employment	
	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted
College share	0.32	4.05	0.14	3.48	0.030	10.7	0.030	1.51	−0.047	0.026
	[2.20]*	[7.51]***	[1.40]	[6.58]***	[0.27]	[6.68]***	[0.23]	[5.67]***	[−0.51]	[0.28]
Observations	7699	7699	8205	8205	8257	8257	7875	7875	7540	7540
R-square	0.066	0.21	0.14	0.53	0.14	0.56	0.053	0.15	0.058	0.048
Norm year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
2-digit NAICS FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 21
Multinomial logit regressions relating bankruptcy and post-bankruptcy outcomes to human capital, with two-digit NAICS fixed-effects

The table presents estimates from multinomial logit regressions of the relationships between *college share* and firm outcomes at the resolution of bankruptcy and after emergence from bankruptcy. The dependent variable in specification (1) indicates whether the firm emerged from bankruptcy as an independent entity, was liquidated within bankruptcy, or was acquired within bankruptcy, with emergence as the omitted category. The dependent variable in specification (2) indicates whether the firm was continuing as an independent entity, refiled for bankruptcy or was liquidated out of court, or was acquired as of five years after emergence from Chapter 11, with continuation as the omitted category. See Section 3 for definitions of *College share*. Covariates are measured in the year prior to filing for Chapter 11. *Log sales* is defined as the logarithm of total revenues in millions. *Leverage* is defined as the book value of total liabilities divided by the book value of assets. *Industry-adjusted profitability* is defined as EBITDA divided the book value of assets, adjusted by its median value within a three-digit NAICS industry. Log sales, leverage, and industry-adjusted profitability are winsorized at the 5% level. Marginal effects are reported at the means of the explanatory variables, with the absolute values of their Z statistics in brackets. Standard errors are clustered at the three-digit industry level.

	(1) Bankruptcy		(2) Post-bankruptcy	
	Liquidated	Acquired	Refiled/Liquidated	Acquired
College share	0.2124	0.0458	−0.1329	0.0001
	[1.39]	[0.89]	[2.83]***	[0.00]
Log sales	−0.019	−0.012	0.01	0.005
	[2.14]**	[3.40]***	[3.31]***	[2.12]**
Leverage	−0.257	−0.014	0.015	0.03
	[4.73]***	[0.60]	[0.83]	[2.05]**
Ind-adj profitability	−0.167	0.02	−0.057	0.022
	[2.34]**	[0.66]	[2.33]**	[0.92]
Constant	0.802	−1.658	−0.052	−0.682
	[3.04]***	[11.85]***	[1.15]	[4.81]***
Observations	1409	1409	391	391
Log Likelihood	-1248.56		-301.34	
Pseudo R2	0.08		0.14	
2-digit NAICS FE	yes	yes	yes	yes

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 22
OLS regressions relating college share to college wage premia

In each regression, the dependent variable is the share of college graduates in each three-digit NAICS industry in the CPS March supplement between 1981-2004. The college wage premium is defined for full-time, private sector workers as the average wage among workers with at least sixteen years of education divided by the average wage among workers with fewer than sixteen years of education. Both measures are weighted using the CPS individual March supplement weight.

	(1)	(2)	(3)	(4)
College premium	0.21	0.22	0.12	0.10
	[91.4]***	[89.7]***	[47.5]***	[40.2]***
Observations	1713	1713	1713	1713
R-square	0.83	0.83	0.96	0.97
Year FE	no	yes	no	yes
Naics FE	no	no	yes	yes
* significant at 10%; ** significant at 5%; *** significant at 1%				

Table 23
OLS regressions relating employer tenure to returns to tenure

In each regression, the dependent variable is the average employer tenure for workers in each three-digit NAICS industry in ten CPS supplements between 1981 and 2004 (see Appendix Section A.3 for details). The return to tenure is defined as the coefficient estimate for employer tenure in a regression of log weekly gross earnings on educational attainment, a quadratic in potential experience, and employer tenure for full-time workers within each industry for each year.

	(1)	(2)	(3)	(4)
Return to tenure	0.046	0.094	0.025	0.076
	[0.31]	[0.64]	[0.34]	[1.16]
Constant	7.27	7.25	7.03	7.04
	[78.3]***	[23.6]***	[19.2]***	[20.0]***
Observations	813	813	813	813
R-square	0.00012	0.037	0.81	0.85
Year FE	no	yes	no	yes
Naics FE	no	no	yes	yes
* significant at 10%; ** significant at 5%; *** significant at 1%				

Table 24
OLS regressions relating displacement wage changes to years of schooling and employer tenure

In each regression, the dependent variable is the change in log weekly earnings from their pre- to post-displacement jobs for workers who were involuntarily displaced from their jobs as identified in the CPS displaced worker supplements from 1996, 1998, 2000, 2002, and 2004 (see Appendix Section A.5 for details). The universe includes workers who were displaced from full-time, private-sector jobs and were employed full-time at the time of the survey. Specification (1) includes all displaced workers, specification (2) includes workers who remained in the same three-digit NAICS industry before and after displacement, specification (3) includes workers who change industries after displacement, specification (4) includes workers who did not change occupations after displacement, and specification (5) includes workers who changed occupations after displacement.

	(1) All	(2) No industry change	(3) Industry change	(4) No occupation change	(5) Occupation change
Years schooling	-0.0098	0.0013	-0.021	0.0013	-0.018
	[-2.24]*	[0.34]	[-3.17]**	[0.43]	[-2.82]**
Employer tenure (lost job)	-0.012	-0.0078	-0.014	-0.0050	-0.014
	[-5.04]***	[-1.75]	[-5.05]***	[-2.26]*	[-4.48]***
Experience	-0.0085	-0.0051	-0.010	-0.013	-0.0085
	[-3.52]***	[-1.13]	[-3.50]***	[-2.84]**	[-2.55]*
Experience^2	0.00013	0.000082	0.00017	0.00023	0.00013
	[2.47]*	[0.72]	[2.64]**	[2.44]*	[1.73]
Constant	-4.36	-4.49	-4.22	-4.42	-4.27
	[-65.1]***	[-88.0]***	[-41.7]***	[-78.8]***	[-42.0]***
Observations	8869	2864	6005	2720	6117
R-square	0.031	0.014	0.049	0.022	0.040
Survey year FE	yes	yes	yes	yes	yes
Naics FE	no	no	no	no	no

* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1
Trends in Human Capital

Average college share and employer tenure among full-time workers in the private sector in the Current Population Survey (CPS). College share and employer tenure are defined in Section 3.