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ABSTRACT

We use novel data from a leading online job search platform to examine the impact of corporate distress on firms' ability to attract job applicants. Survey responses suggest that job seekers accurately perceive firms' financial health, as measured by the companies' credit default swap prices. Analyzing responses to job postings by major financial firms during the recent financial crisis, we find that an increase in an employer's distress results in fewer and lower quality applicants. These effects are particularly evident when the social safety net provides workers with weak protection against unemployment and for positions requiring advanced training.

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1. Introduction

A company's financial condition has far-reaching effects on the firm, including on its ability to attract and retain human capital. Corporate financial insecurity can lead current employees to search for more stable positions and new recruits to focus their searches elsewhere. Concerns about short-run solvency strain a distressed firm's reputation for treating employees fairly (Maksimovic and Titman 1991), and corporate distress often leads firms to downsize their workforce. Average employment decreases by 27% in the two years surrounding a bond default (Agrawal and Matsa 2012) and by 50% or more around a bankruptcy filing (Hotchkiss 1995).

Job loss can be extremely costly for workers—these workers face reductions in consumption during unemployment and less stability in earnings and employment, even ten years later (Gibbons and Katz 1991; Jacobson, LaLonde, and Sullivan 1993; Gruber 1997; Sullivan and von Wachter 2009). With job displacement also leading to worse health outcomes, higher mortality, lower achievement by children, and other adverse consequences (see Davis and von Wachter 2011 for a survey), even the prospect of job insecurity imposes sizeable psychological costs on workers (Sverke and Hellgren 2002).

Given all of these costs, workers are likely to avoid distressed firms. Unless distressed firms can offer a sufficient compensating wage premium, they may have difficulty recruiting new talent, particularly for positions that require firm-specific investments. Although such costs of distress feature prominently in theoretical explanations of firms' capital structure decisions (Titman 1984; Berk, Stanton, and Zechner 2010), their empirical relevance is less clear. Moreover, although labor economists have studied worker-firm matching and job search models in detail, there has been little empirical work on firm recruitment and hiring (Oyer and Schaefer 2011).

Empirical evidence is sparse in part because it is challenging to separately identify the effects of corporate distress on demand and supply in the market for labor. Distress often reduces a firm's scale and labor demand, while also making the firm less attractive to workers and reducing labor supply. With data only on employment or wages, it is impossible to separate these channels empirically.

This paper exploits several novel datasets from a large online job search platform to overcome this identification challenge.[1] In total, the platform has millions of active users every month, more than half of whom are college graduates. With microdata on job applications, we can hold demand fixed and examine how the supply of workers to specific jobs at individual firms is affected by firms' financial health. We study a period of economic crisis—early 2008 to early 2010—and focus on prominent firms in the financial services industry.

We first examine survey responses of job seekers on the online platform to evaluate job seekers' perceptions of firms' financial health. In surveys conducted between October 2008 and March 2010, thousands of respondents were asked to assess the financial health of potential employers on a five-point scale. In all, the surveys elicited perceptions of about 145 firms. We match these firm-level assessments with indicators of financial strength, including daily credit default swap (CDS) prices. Consistently, we find that job seekers' perceptions are highly positively correlated with firms' true financial health.

Our second analysis examines whether applicants act on these perceptions. We exploit a second proprietary dataset that describes all of the jobs posted by forty high-profile financial services firms to the job search platform between April 2008 and December 2009.[2] Building on

[1] We were provided the data under a nondisclosure agreement, which restricts us from identifying the online platform. This agreement places no constraints on the conclusions of the analysis.

[2] Our data provider requested that we restrict the application sample to one industry. We chose the financial sector because the application data have strong coverage, many firms have traded CDS, and

Holzer, Katz, and Krueger (1991), we examine the volume of applications to open positions as a measure of workers' interest in these jobs. We match the application data with firms' CDS prices to assess the relationship between firm health and workers' willingness to apply.

During the recent crisis period that we study, corporate financial health varied substantially both between and within financial firms over time. Our identification strategy exploits these changes. The richness of the data allows us to develop a compelling counterfactual in our analysis. For example, we compare job seekers' interest in a given posting to their interest in other postings for the same type of job in the same geographic area and the same month, and we test whether the firm's credit default risk at the time of the posting affects the number of applications.[3] The detailed fixed effects rule out many possible alternative interpretations, such as a decline in the social status of finance jobs or changes in unobserved local industry- and occupation-specific firm investment opportunities or labor market conditions. All of our analyses also control for firm fixed effects so that we are measuring only time-varying relative differences in the demand for positions at each employer. We find that firms attract significantly fewer applications per job opening during periods of corporate distress. On average, about 20% fewer job seekers apply to a given position for each 10-percentage-point increase in the firm's probability of default (as indicated by its CDS price).[4] The results are not driven by outliers and are robust to alternative specifications, such as using equity (rather than CDS) prices to capture changes in firms' financial health. Given the low cost of submitting an online application to these

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firms experienced considerable heterogeneity in distress in this period—some sample firms experienced extreme distress, some less extreme, and some not at all. The survey results show that potential applicants are aware of firms' financial conditions in other industries as well.

[3] Of course, we are not suggesting that job seekers track individual firms' actual CDS prices over time. After establishing that job seekers' perceptions of firms' financial stability are correlated with CDS prices, we use these prices to proxy for firms' (actual and perceived) overall financial health.

[4] Throughout the paper, we abstract away from recovery, liquidity, and market, counterparty, and other risk premia in inferring firms' probabilities of default from their CDS prices.

jobs, we would expect to find even larger effects on potential applicants' propensity to *accept* a job offer at a distressed firm.[5]

Analyses of potential mechanisms confirm that the decline in applications cannot be fully explained by shifts in labor demand. First, we consider the possibility that firms recruit for different positions during periods of distress; if the positions posted were more specialized, then the decline in observed applications could be attributed to there being a smaller pool of potential applicants. But to the contrary, when we control for the jobs' specific titles, the results remain negative and statistically significant. Second, we consider whether distressed firms attract fewer applicants because they are constrained to offer lower salaries. However, we find that advertised salaries, if anything, increase when a firm is in distress—consistent with distressed firms paying a compensating differential to offset a decrease in labor supply.

Heterogeneity in the effect along two dimensions further supports the interpretation that firms' distress affects labor supply—that is, holding fixed other job-specific and labor market-specific characteristics, a worker prefers to work for a firm that is in better financial health. We exploit state-level variation in unemployment insurance (UI) and find that workers are less sensitive to potential employers' distress in locations in which unemployment costs are lessened by a stronger social safety net.

We also find that large upfront costs make job seekers reluctant to apply to distressed firms. Relocating to take a job is typically quite costly; in addition to the financial cost, relocating disrupts social and familial networks. If corporate distress reduces a firm's desirability as an employer, then we would expect the largest reductions among applications from workers who would need to relocate to start work. Consistent with a reduction in labor supply, we find that the proportion of job applications received from out-of-state applicants decreases by

[5] Our data provider does not observe who is interviewed or hired for the open positions.

approximately 7% for a 10-percentage-point increase in the probability of default.

The negative effect of corporate distress on labor supply has potential implications for distressed firms' human capital accumulation and retention. We find that applicants' average quality, as measured by the average earnings and education of their ZIP codes, declines with firm distress. Furthermore, the estimated sensitivity of applications to distressed companies is most pronounced and consistent for jobs with high educational requirements. These results align with Topel (1991) and Topel and Ward's (1992) findings that the costs of unemployment are higher for workers who have been in their jobs longer and that job tenure is positively correlated with education. Connolly and Gottchalk (2006) argue that highly educated workers bear particularly large unemployment costs because jobs that require substantial education also often require firm-specific investment by the employee. It is also possible that more highly educated workers are more attuned to changes in firms' financial health.

Although our application results apply directly to distressed firms' challenges in recruiting new employees, firm characteristics that attract new workers are likely similar to those that encourage existing workers to remain with the firm. We find that distressed firms actively try to hire new employees despite large, concomitant overall declines in employment, suggesting that these firms experience relatively high employee turnover. Current workers are likely reluctant to stay with a distressed firm because of diminished job security and other outcomes of corporate distress.

Our analysis broadly supports the argument that firms suffered both directly and indirectly because of their distress during the recent economic crisis. Existing theories—and the empirical evidence presented in this paper—may explain, in part, why distressed firms struggle to regain financial stability. Indeed, a firm's distress appears to be reinforced by its inability to

retain and attract skilled workers who could contribute to recovery.

For the most part, our analysis does not distinguish between economic and financial distress—that is, whether job seekers are responding strictly to firms' deteriorating operating performance or also to the firms' financial structure—but it is likely that corporate debt amplifies workers' responses to operating shortfalls. To the extent that the reductions in labor supply documented in this paper are related to concerns about job security, we would expect workers to respond similarly to financial distress, which has been shown to increase the likelihood of downsizing and job insecurity (Agrawal and Matsa 2012).

Firms can avoid financial distress and create value by choosing more conservative financial policies. Agrawal and Matsa (2012) find that increases in legally mandated unemployment benefits, which reduce workers' exposure to unemployment risk, lead to increases in corporate leverage. Kim (2012) exploits new manufacturing plant openings to argue that firms increase financial leverage when their workers have additional alternative job opportunities should the firm encounter distress. Other recent papers also integrate labor economics and finance and focus on the use of leverage as a strategic input in the bargaining process between workers and firms (e.g., Matsa 2010; Chen, Kacperczyk, and Ortiz-Molina 2011; Benmelech, Bergman, and Enriquez 2012).

Since Titman (1984), indirect costs have been used to rationalize the reluctance of firms to use debt financing despite the large tax and other benefits of debt. In their classic study, Andrade and Kaplan (1998) analyze 31 highly leveraged transactions and estimate financial distress costs to be about 10% to 20% of firm value. But the exact sources of these costs remain unclear. In addition to the labor market effects examined in this paper, distress may affect real asset prices (Pulvino 1998), competitors' collateral values (Benmelech and Bergman 2011), and

how firms compete in product markets, including entry (Chevalier 1995a), exit (Kovenock and Phillips 1997; Zingales 1998), pricing (Chevalier 1995b; Phillips 1995; Chevalier and Scharfstein 1996), and product quality (Rose 1990; Borenstein and Rose 2003; Matsa 2011; Phillips and Sertsios 2012). Most recently, Hortascu et al. (2012) find that prices for used automobiles respond to high-frequency fluctuations in manufacturers' distress. They estimate that a 10-percentage-point increase in the probability of default decreases the price of a used car by $68 (or 0.5%); the labor market impacts appear be much larger, as we find the volume of applications drops by about 20%.

Our findings also advance the literature on compensating wage differentials for unemployment risk. Labor economists, dating back to 18th century Scottish economist Adam Smith (1976), theorize that workers require higher wages to compensate them for bearing unemployment risk. Empirical estimates of compensating wage differentials are typically based on worker surveys in which unobserved worker characteristics, including their productivity, could be correlated with unemployment risk (e.g., Abowd and Ashenfelter 1981; Topel 1984; Fishback 1998; Averett, Bodenhorn, and Staisiunas 2005). In his handbook chapter on compensating wage differentials, Sherwin Rosen (1986) concludes that "On the empirical side of these [research] questions, the greatest potential for further progress rests in developing more suitable sources of data" (p. 688). We find that, when firms' probability of default is 10-percentage-points higher, they post 16-to-18-log-point higher wages for a given open position.

Finally, while employee job search has been well-studied, much less is known about firms' search for employees (Oyer and Schaefer 2011). Existing research focuses primarily on vacancy durations (van Ours and Ridder 1992) and rates (Holzer 1994) or firms' recruitment strategies (Barron, Bishop and Dunkelberg 1985; Burdett and Cunningham 1998). One exception

is Manning (2000), who finds that the volume of applications to low-wage jobs at five British firms responds to advertised wages, location, and the firms' proximity to public transportation. Our paper takes this literature in a different direction by analyzing human resource activities in the broader context of the firm. Specifically, we show that a business's financial condition has meaningful consequences for the recruitment and retention of human capital.

In Section 2, we examine job seekers' self-reported perceptions of firms' financial health. In Section 3, we analyze the relationship between firms' financial success and the volume of applications attracted to open positions. In Section 4, we consider competing explanations for the relationship, and we explore potential implications of our results in Section 5. We conclude in Section 6.

2. Do job seekers accurately perceive firms' financial health?

To study the accuracy of job seekers' perceptions of companies' financial positions, we analyze new data from a set of proprietary surveys. The 85 surveys were conducted by a large online job search platform between October 2008 and March 2010.

A typical survey asked respondents to consider four firms that are labor market competitors in a given industry. The questions asked job seekers to indicate their perception of firms' performance on several dimensions, including salary, training, reputation, and company financials. Answers were given on a five-point scale, where "1" indicates a perception of very weak performance and "5" indicates a perception of very strong performance in a particular dimension. Respondents who were unsure (or, assumedly, unfamiliar with the firm in question) were asked to indicate "0", and their responses are excluded from the data used in our analysis.[6]

[6] On average, approximately 38% of respondents indicated that they were unsure about the firms' financial health (26% for financial services firms). The "unsure" rates were similar for questions about

Respondents' perceptions of a firm's financial health are summarized by average scores on the five-point scale. In the analysis that follows, we examine these average scores at the firm-survey level.

To assess whether job seekers' perceptions of firms' financial health reflect companies' actual performance, we matched the survey responses to daily credit default swap (CDS) prices. CDS prices provide a measure of individual firms' financial health. CDS are financial contracts that pay off when a firm defaults on a specific existing loan or bond obligation. A firm's debt holders may use CDS as protection against a bad financial event; however, unlike traditional insurance, CDS buyers need not hold any of the firm's actual debt. CDS prices are typically denoted in basis points and increase with the probability of default—that is, CDS prices are higher for riskier companies. Consider a simple example in which the CDS price for a firm's debt is 150 basis points or 1.5%. An investor can buy $1 million worth of CDS protection from a large bank for $15,000 each period. If the firm were to default on its entire debt, then the bank would pay $1 million to the CDS buyer.

In broad terms, the CDS prices that we examine reflect the likelihood that firms fall into severe financial trouble within five years. Throughout our analysis, we use prices, obtained from Bloomberg, for five-year CDS contracts covering firms' senior bonds. These CDS prices are available on a daily basis. We also compare survey respondents' assessments to quarterly accounting data from Compustat.

Although we are restricted from identifying which specific firms are covered by the surveys, Table 1 reports summary statistics. As described in Panel A, the surveys collectively

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companies' reputations and higher for questions about corporate culture, compensation, and training. Unawareness about firms' financial health appears to be unrelated to distress—the correlation of CDS price and the percentage of respondents who are unsure is small and not statistically significant (-0.02; $p = 0.84$).

cover 145 unique firms for which CDS prices or Compustat data are available. Some firms are included in multiple surveys, yielding 194 total firm observations and 126 observations for which CDS prices are available. On average, about 150 survey responses underlie each firm observation. The average survey financial score is 3.3 on the five-point scale.

The surveys mostly cover large firms. Panel B of Table 1 describes the survey firms using data from the Compustat quarterly file for the first quarter of 2008 (prior to start of the surveys). Among survey firms with information in Compustat, the average market capitalization was $32 billion. The average return on assets was 2%, sales growth was 11%, and the market-to-book ratio was 1.65. Although the typical survey firm had modest financial leverage—total debt averaged 29% of book assets—a minority were highly leveraged with 17% having more than 50% leverage. Panel C of Table 1 reports the firms' distribution across industries. The two most represented industries are manufacturing and finance with about thirty firms each. Overall, the sample includes large firms that performed moderately well during the previous quarter.

Figure 1 compares CDS prices to job seekers' average rating of the financial health of firms included in the survey.[7] Panel A presents results for all firms for which data were available. The figure is striking—when the CDS price is high, indicating that a firm is at higher risk of defaulting on its credit obligations, job seekers perceive the firm's weak financial position.

The recent economic crisis, which began in late 2007, provides us with an opportunity to study the labor-related costs of firm distress over a period in which many firms were experiencing dramatic changes in their financial health. The rise and fall of firms in the financial industry received widespread attention—the health of both distressed and healthy financial

[7] To conceal firms' identities, Figures 1 and 2 only include firms with CDS prices below 1,000 basis points. The regression analyses include all firm observations.

services firms was likely to be particularly salient for job seekers in 2008 and 2009.

Thirty firms in the financial services industry (including banks, lenders, investment firms, and insurance companies) are among the firms covered in the surveys. Panel B of Figure 1 plots CDS prices and finance-related survey scores for the eighteen of these firms for which CDS prices are available. Similar to the plot with all firms, job seekers' perceptions of firms' financial health appear to be associated with the firms' actual financial positions.

Both panels of Figure 1 suggest a clear link between job seekers' perceptions and firms' actual financial health. Regression analysis, controlling for several other factors that might influence survey scores, provides further evidence of the relationship. Table 2 reports these regression results; Panel A presents results for all firms in the surveys for which CDS prices are available, and Panel B focuses on firms in the financial services industry. In various specifications, we include controls for firms' industries (using three-digit NAICS codes) and survey quarter fixed effects.

In all of the regressions, the coefficient on the CDS price variable is negative and statistically significant ($p < 0.01$). In general, a one-standard-deviation increase in CDS prices reduces the average survey score by 0.17 to 0.19 (approximately 0.4 to 0.5 of a standard deviation). Job seekers' are unlikely to be tracking CDS prices in a literal sense; more likely, their perceptions are based on indirect sources, such as media reports and word of mouth. Whatever forms their perceptions, our results suggest that they accurately reflect the overall health of individual firms.

In addition to CDS prices, other financial measures also provide compelling evidence that job seekers perceive differences in firms' health. Using quarterly financial data from S&P's Compustat, we generate several variables to represent aspects of companies' financial strengths

or weaknesses: quarterly return on assets reflects a firm's current profitability; sales growth (over last year, same quarter) reflects a firm's past performance; and the market-to-book ratio reflects a firm's future prospects.

Because recent performance is likely the most salient for job seekers, we examine the conditional correlation of the mean survey response and a firm's performance in the previous quarter. Table 3 reports results from several robustness checks for all firms and for the subsample of firms in the financial services industry. Again, our results suggest that job seekers' perceptions of firms' financials are highly correlated with firms' actual performances.

Panel A of Table 3 reports results for the full sample. Results in column 3.A indicate that a one-standard-deviation increase in quarterly return on assets is associated with an increase in the average survey score of 0.1 (approximately 0.13 of a standard deviation; $p < 0.01$). Similarly, a one-standard-deviation increase in sales growth (column 3.B) or the market-to-book ratio (column 3.C) is also linked to 0.1 point higher survey scores ($p < 0.10$ and $p < 0.01$, respectively). In Panel B of Table 3, we restrict the survey sample to ratings of financial services firms. Among these firms, a one-standard-deviation increase in quarterly return on assets is associated with a 0.4 point improvement in the survey score (nearly 0.9 of a standard deviation; $p < 0.01$; column 3.E). As reported in columns 3.F and 3.G, a one-standard-deviation increase in sales growth or the market-to-book ratio is associated with an improvement of approximately 0.1 and 0.2 survey points (approximately 0.25 and 0.50 of a standard deviation; $p < 0.05$ and $p < 0.01$, respectively).[8] Overall, the patterns in Table 3 provide further evidence that job seekers' assessments reflect firms' actual financial health.[9]

[8] For the sample of financial services firms, the standard deviation is 1.56% for return on assets, 20.28% for sales growth, and 0.79 for the market-to-book ratio.

[9] The magnitude and statistical significance of the results in Tables 2 and 3 are very similar when the regression coefficients are weighted by the number of survey respondents.

A final test suggests that job seekers perceive firms' economic *and* financial distress. In columns 3.D and 3.H, we report regressions that relate firms' financial scores with both their return on assets and CDS price. The results show both relationships to be statistically significant. Even after controlling for a firm's operating performance, job seekers' rating of the company's financials is sensitive to the firm's likelihood of defaulting on its debt obligations. The sensitivity declines when we control for operating performance (see Table 2) but remains sizeable and statistically significant ($p < 0.01$). In both samples, after conditioning on ROA, a one-standard-deviation increase in CDS prices reduces the average survey score by 0.16 to 0.17 points (approximately 0.40 of a standard deviation).

3. Does firms' financial health affect job seekers' application behavior?

The surveys analyzed above suggest that job seekers' perceptions are attuned to firms' financial health. But do these perceptions affect the firms' appeal to potential applicants? We next examine how employers' financial health affects job seekers' choices of where to submit applications. We ask: Do distressed firms attract fewer applications to open positions?

Our analysis focuses on firms in the financial services industry during the volatile months between April 2008 and December 2009. Variation over this time period allows us to identify the relationship between firms' financial health and their search for employees. Figure 2 presents daily CDS prices for 99 financial services firms from 2008 to 2010.[10] The solid line represents the median CDS price, and the dashed lines represent the 25th and 75th percentile prices, respectively. Some firms fared relatively well over this period—the 25th percentile of the CDS price appears relatively stable over time. As suggested by the dramatic change in the 75th

[10] These 99 firms are all of the firms in the financial sector with total assets greater than $25 billion for which CDS prices are available.

percentile CDS price, however, other firms suffered near collapse.

In the analysis that follows, we restrict our sample to the forty large financial firms with total assets exceeding $25 billion and for which both job applications data and CDS prices are available. The job listing and application data are from the same large online job-search platform. This proprietary dataset includes job postings for some of the highest-profile financial services firms in the United States—indeed, most of the firms are household names.

The platform allows firms to post job listings and job seekers to apply to these positions. The platform is supported by revenue from companies posting positions and from advertising; job seekers use the platform for free. All job listings include firm identity, job title, and location information. Firms may also elect to describe the job tasks, educational requirements, compensation, and other benefits. Job seekers can browse job categories—filtering by location, educational requirements, and job characteristics—or search the platform using key words. Firms cannot pay to improve their jobs' placement in these search results.

Summary statistics are reported in Table 4. The sample includes data for 96,065 unique jobs posted by the forty firms between April 2008 and December 2009. The postings include a wide range of positions, including jobs in retail branches (e.g. teller, account executive, and financial advisor) and back-office jobs (e.g. telephone bankers, financial analysts, software engineers, administrative assistants). Figure 3 shows the geographic distribution of job postings, which are spread across all fifty U.S. states roughly in proportion to population.[11] On average, firms posted approximately 2,400 jobs during this 91-week period; the median firm posted roughly 660 jobs. Applications were thick—an average firm attracted 138,646 applications over

[11] Our findings are not limited to large states; for example, we obtain similar estimates when we exclude all states that comprise more than four percent of the sample (California, Florida, Illinois, New York, and Texas).

the study period, and the average job posting received 57.7 applications (median 28).[12]

We collected daily CDS prices for the forty firms of interest. Over the 10,110 firm-days on which jobs were posted, CDS prices averaged $279 for $10,000 of protection (median $174). As shown in Figure 2, however, CDS prices varied considerably, both within and between firms over the study period. An average firm posted jobs in 70% of the weeks in the period of study; conditional on posting any job in a given week, firms averaged nearly 38 listings per week (median 14).

Figure 4 plots the total number of jobs posted each month by the forty firms of interest and these firms' median CDS price. There is a marked decline in job postings from the end of 2008 to mid-2009, the time period over which CDS prices were high for many of the firms in our sample. In the regression analysis that follows, we control for these aggregate patterns using month fixed effects.

To explore the impact of corporate distress on firms' appeal to workers, we examine the relationship between firms' default risk and the volume of applications that they attract. We start by examining the number of applications firms received in October 2008, the month after Lehman Brothers collapsed. Figure 5 depicts the cross-sectional relationship between the number of applications per job posting and firms' CDS price. To avoid identifying specific firms, we plot the predicted number of applications as a quadratic function of the CDS price. Firms with higher CDS prices receive fewer applications per posting—whereas a firm with a CDS price of 100 for $10,000 of protection receives approximately 65 applications per position, a firm with a CDS of price of 1,000 receives fewer than 45.

Figure 5 shows a stark pattern; but without any controls and with only a single cross-

[12] We do not observe job postings to which no one applied. If firms' distress decreases the number of applications (as our later analysis suggests), then missing these observations may lead us to understate this relationship.

section, we cannot distinguish whether the relationship is attributable to the company's financial health or to other firm characteristics. To address these concerns, we turn to multivariate regression analysis on the full panel—using variation over time and across firms, we capture the impact of individual firms' distress on job seekers' behavior, while controlling for other firm-, time-, location-, and job-specific factors.

In these regressions, the unit of observation is a unique job posting, and the dependent variable is the natural log of the number of applicants. We use a firm's average CDS price for the calendar month in which the job was first posted.[13] For ease of interpretation, the CDS price variable is denoted as the price to purchase $1 of default protection, such that the price effectively represents the probability of default, if you set aside the pricing effects of recovery, liquidity, and risk premia. Standard errors are clustered at the firm level to account for correlation across jobs posted by the same company.

Table 5 presents results from baseline regressions that use various sets of controls. The specification reported in column 5.A controls for firm and month fixed effects. The firm fixed effects account for any fixed differences between firms, such as industry, year of incorporation, and broad market positioning. The month fixed effects account for the changing aggregate economic conditions during the financial crisis; for example, the effects sweep out the aggregate patterns illustrated in Figure 4. The results suggest that a $0.10 increase in the price of $1 of CDS protection is associated with a nearly 20 log point decline in the number of applications per posting ($p < 0.05$). To account for geographic variation in job opportunities and changes across states over time, column 5.B includes state fixed effects, and column 5.C includes a separate state fixed effect for every month in the sample period. The state fixed effects are assigned based on where the specific job is located, not where the firm is headquartered or incorporated. The

[13] Job postings are typically open to potential applicants for thirty days.

coefficients on CDS price are similar and suggest that a $0.10 increase in the price of CDS protection is associated with a 17 to 18 log point drop in applications ($p < 0.05$ and $p < 0.01$, respectively).

Even with the detailed firm and state-month controls, it is possible that there is variation over time in the characteristics of the jobs posted by a given firm. This could bias the results if any changes in job characteristics were correlated with CDS prices. For example, administrative and clerical jobs always tend to receive more applications than do accounting jobs; one might ask: are distressed firms relatively more likely to post accounting jobs when CDS prices deteriorate? To evaluate this possibility, we exploit a classification provided by the online platform. Posted jobs are assigned up to four of nineteen job types.[14] Examples of job types include administrative and clerical, sales, professional services, finance, and customer service.

Column 5.D presents results that include indicator variables for each of the nineteen classification codes. The coefficient on CDS price is virtually unchanged—a $0.10 increase in the CDS price is associated with a 17 log point decline in applications ($p < 0.01$). In column 5.E, we allow for even finer heterogeneity in job types by including the interactions between job classifications for positions that fall into multiple job categories. For example, we separately control for customer service jobs in banking and customer service jobs in insurance. In total, this amounts to 679 unique detailed job classifications. The coefficient on CDS price is again negative and statistically significant—a $0.10 increase in the CDS price is associated with a 13 log point decline in applications ($p < 0.01$).

In a final specification, we allow the impact of these 679 detailed job types to vary by state-month. With these additional interactions, the specification identifies the relationship

[14] The classification includes eighteen named categories. Any job type represented in less than 2% of job postings was coded as the 19th category, "Other".

between CDS price and the volume of applications within a given detailed job type in a given state during a single month. The estimated coefficient on CDS price is again statistically significant and suggests that a $0.10 increase in the price of $1 of CDS protection is associated with a nearly 24 log point decrease in the number of applicants ($p < 0.01$).[15]

These results appear to be quite robust. In Table 6, we present analyses that assess the role of outliers by winsorizing either the application or CDS data at the 1% or 5% tails. Winsorizing the number of applications has little effect on the estimates (columns 6.A and 6.B). Winsorizing the CDS price yields estimates that are negative, statistically significant, and even larger in magnitude than those reported in Table 5. After winsorizing and controlling for firm and detailed job type-state-month fixed effects, a $0.10 increase in the CDS price is associated with approximately a 55- to 60-log-point decline in the number of applications ($p < 0.05$; columns 6.C and 6.D). In our sample, firms in the 1% tail of CDS prices were nearly immediately insolvent. We find that the decline in applications associated with a unit increase in CDS price is stronger for less extreme distress, consistent with applicants having concerns about medium- to long-term job security rather than only about immediate unemployment.

We also examine an alternative functional form. In column 6.E, we model a linear relationship between CDS price and the volume of applications. We again find a negative and statistically significant relationship. A $0.10 increase in the CDS price is associated with about five fewer applicants per open position ($p < 0.05$)—a decrease of approximately 9%, relative to the mean.[16]

[15] Some of the job postings specify educational requirements. As described in Section 5.2, 25,193 job postings require college and 11,802 explicitly require high school or less. Controlling for these educational requirements in a specification similar to column 5.F on this smaller sample, the coefficient on CDS price is –2.91 (s.e. 1.12; $p < 0.01$).

[16] Given the high variability in the number of applications per position (see Table 4), we measure

We also consider firms' stock prices as an alternative high-frequency measure of firm performance. Although both CDS and equity prices should reflect all available information about firms' prospects and risks of default, these factors will manifest in the prices differently.[17] CDS prices most directly reflect the probability of a credit event, in the case of our study, within the next five years for the firms' senior corporate bonds. A credit event is undoubtedly bad for potential employees, but poor corporate performance can lead to layoffs and impose other costs on workers even when the firm does not default on its debt. Such nondefaulting underperformance may more likely be reflected in firms' equity market value, although equity values reflect many other factors as well.

Naturally, we expect any relationship between CDS and stock prices to be negative—increases in a firm's default risk should be reflected in higher CDS prices and lower stock prices. Thus, we expect the relationship between stock price and the volume of applications to be positive. In column 6.F, we estimate the impact of a change in firms' stock prices. Controlling for firm fixed effects and detailed job type-state-month interactions, the estimates suggest that a 10% decrease in the stock price is associated with a 2% decrease in the number of applicants per job posting ($p < 0.01$).

4. Why do applications decrease?

Sections 2 and 3 present evidence that job seekers both perceive and respond to changes in firms' financial health. In this section, we ask "why?" We consider competing explanations for the relationship and conclude that a reduction in labor supply to distressed firms plays a role.

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application counts in logs in the main specifications.

[17] Papers studying the relationship between the stock and CDS markets include Longstaff et al. (2003), Fung et al. (2008), Forte and Pena (2009), and Norden and Weber (2009).

4.1 Labor demand

Although our main analysis has focused on job seekers' decisions, we consider the possibility that changes in firms' labor demand underlie the applicants' behavior. We evaluate two potential demand-side explanations: (1) firms' hiring needs become more specialized during periods of distress and (2) distress constrains firms' ability to compensate workers.

Firms' human capital needs may change when they are distressed. For example, a distressed commercial bank may be more focused on servicing existing loans than on originating new loans. As a result, hiring may shift from loan officers to collection specialists. To the extent that distressed firms recruit for specialized positions, the decline in observed applications might be attributable to a smaller pool of potential applicants rather than to workers having reduced interest in these firms. If distress shifts hiring across job classifications—for example, from marketing to accounting—then these effects would be captured by the detailed job type controls in Section 3. However, these controls would not account for hiring changes *within* a given job classification toward positions with smaller baseline applicant pools.

To evaluate this possibility, we analyze changes in the volume of applications for particular jobs. Every job posting in the dataset includes a specific job title—for example, Agricultural Loan Officer. Across all firms, the data include nearly 33,800 unique job titles. To confirm the homogeneity of jobs posted with the same job title, we examine variation in their salaries. Salary information was included in 6,391 job postings in the sample; we do not observe nonmonetary compensation, such as health insurance or other benefits.[18] Whereas the coefficient of variation of posted salaries across all jobs is 1.20, the average coefficient of variation within a

[18] The salary information is coded into categories of $5,000 increments for salaries up to $100,000 and $25,000 increments for salaries between $100,000 and $500,000. In our analysis, we use the midpoint of each category and recode salaries above $500,000 to $650,000. The results reported in Table 7 are robust to using alternative recoding values and to excluding job postings with salaries over $500,000. The median annual base salary is $52,500, with an interquartile range of $32,500 to $97,500.

job title at a given firm in a given state is only 0.02. This suggests that job characteristics are similar across positions with the same job title.

In the analysis presented in column 7.A of Table 7, we augment our baseline specification with fixed effects for each job title. The analyses reported in columns 7.B and 7.C include even more demanding controls, capturing fixed effects for each individual job title in each firm and for each job title within each firm in each state, respectively. In all of these specifications, the coefficient is negative and statistically significant—a $0.10 increase in the CDS price is associated with a 9.6 to 11.1 log point decrease in applications ($p < 0.05$). Together, these estimates suggest that the main result—that firms' distress is associated with a lower volume of applicants—is not being driven exclusively by changes in the human capital needs of distressed organizations.

Even if firms' human capital needs are not changing, distress may constrain their ability to hire. If applicants dislike working for distressed firms, then firms may need to offer higher salaries to attract the same number of applicants. But distressed firms may not have the resources to increase (or even maintain) their salary offers to new employees. In this case, we might observe fewer applications because of lower salaries, but not because of increased layoff risk or other labor supply considerations.

To investigate this potential demand-side explanation, we examine how salaries change when firms experience distress.[19] Columns 7.D through 7.F of Table 7 present results from regressions analyzing the natural log of the posted salary as the dependent variable. To focus on salary changes for specific jobs, we again include job title fixed effects, firm fixed effects, and

[19] We find no evidence that a firm's distress affects its propensity to post salary information. In regressions of an indicator for salary information availability with controls similar to those in Table 7, the coefficients on CDS price are negative and not statistically significant. The estimates range from -0.9 (s.e. 1.2) to -1.6 (s.e. 2.4) percentage points for a $0.10 increase in the CDS price.

state fixed effects and their interactions. The estimates suggest that, if anything, firms offer higher salaries to attract applicants during periods of distress. A $0.10 increase in the CDS price is associated with a 16 to 18 log point increase in salary. These estimates are somewhat less precise than for application volumes, which is expected given the smaller sample size. The increase in salaries is consistent with the literature on compensating differentials for unemployment risk (see Rosen 1986 for a survey).

Overall, we find no evidence that changes in labor demand can fully explain our results.

4.2 Labor supply

Another possibility is that corporate distress affects labor supply—when offered similar positions and the same wage, a worker may prefer to work for a firm in better financial health. Distress reduces job security (Hotchkiss 1995; Agrawal and Matsa 2012), which imposes both psychological (Sverke and Hellgren 2002) and economic costs (Maksimovic and Titman 1991), even for workers who remain with the firm. The costs of unemployment are even more substantial (Katz and Meyer 1990; Gibbons and Katz 1991; Gruber 1997). Given all of these costs, job seekers may avoid distressed firms, making it difficult for these firms to recruit new workers.

We explore the role of labor supply in two ways. First, we exploit state-level variation in the unemployment insurance system. Although the basic structure of UI is common throughout the United States, there are substantial differences in the generosity of benefits across states. In every state, eligible claimants receive weekly benefits payments for a set number of weeks, based on their employment histories. Following Agrawal and Matsa (2012), we measure the generosity of states' UI systems using the product of the maximum benefit amount and the

maximum duration.[20] We use states' maximum UI benefits in January 2009, which averaged $11,500 (standard deviation $3,600).

More generous UI benefits reduce workers' costs of unemployment. To the extent that job seekers' behavior is influenced by concerns about job security, more generous UI benefits could mitigate these concerns and make workers' less sensitive to firms' distress. Empirically, this would reduce the sensitivity of the volume of applications to CDS prices.[21] In analysis reported in Table 8, we interact CDS prices with the log maximum UI benefit in the state in which the job is located. Although it is not reported, we also control for the uninteracted UI variable in specifications in which it is not absorbed by the fixed effects. To ease interpretation of the CDS main effect, the sample mean is removed from the log maximum UI benefits prior to the interaction.

We find that workers are more willing to apply to positions at distressed firms in states in which unemployment costs are lessened by a stronger social safety net during unemployment. Column 8.A presents results from the baseline specification with firm and month fixed effects. Whereas a $0.10 increase in the CDS price is associated with a 19 log point decline in the number of applications in a state with average maximum UI benefits, this sensitivity is 7 log points lower for states with 25% higher UI benefits ($p < 0.05$). This relationship is robust to the various specifications. As we control for more detailed labor market variation, the point estimates increase in magnitude. Results from our most demanding specification—analysis with

[20] Although ideally we would focus on individual job-level variation in the ratio of the UI benefit to wages, the limited availability of wage data precludes us from adopting this approach. Instead, we exploit state-level differences in UI systems using maximum benefit levels—the primary source of cross-state variation in UI generosity (Moffitt and Nicholson 1982). As an additional test, we exploit variation based on the positions' educational requirements as a proxy for workers' income and liquid savings (see footnote 22).

[21] In theory, more generous UI could also make unemployed job seekers choosier, which might amplify applications' sensitivity to CDS prices. We estimate the net effect.

firm and detailed job type-state-month fixed effects—are presented in column 8.F. Here, a 25% increase in maximum UI benefits cuts the sensitivity of applications to CDS prices nearly in half, from 22 to 12 log points ($p < 0.01$).[22]

To further explore the role of labor supply, we examine whether large upfront costs make job seekers reluctant to apply to distressed firms. Specifically, we study the role of relocation costs. When a prospective employer's financial future is uncertain, the desirability of open positions may be particularly weak for workers who have to relocate for the job. These job seekers may be reluctant to make a substantial upfront investment for a job whose long-run prospects are uncertain.

To examine this mechanism empirically, we limit our sample to job postings for which we observe at least 80% of the applicants' states of residence. For these jobs, 23% of applicants live outside of the state in which the job is located; many of these applicants would likely have to relocate if they took the position. In Table 9, we analyze the percentage of applications from out of state. The regressions are weighted by the number of applications for which location data are available to account for differences in the precision of the out-of-state measure.

We find that firms' distress decreases the proportion of applications from out of state. The coefficient on CDS price is negative and sizable. When controlling only for firm and month fixed effects, the coefficient estimate is large but imprecise (column 9.A). Adding more detailed job market controls reduces the standard error dramatically. With controls for firm and detailed job type-state-month, the estimate is significant at the 1% level. A $0.10 increase in the price of

[22]As a further test, we split the sample based on jobs' educational requirements. Individuals with more liquid savings, such as the college educated, are likely to be less sensitive to marginal differences in UI generosity (Chetty 2008). Consistent with this, the interaction between CDS price and UI benefits is stronger for jobs with lower educational requirements. In an analysis with firm and detailed job type-state-month fixed effects, a 25% increase in the maximum UI benefit lowers the sensitivity of the number of applications to changes in CDS prices by 25 log points (s.e. 10) for jobs requiring only high school education and 7 log points (s.e. 8) for jobs requiring a college degree.

$1 of CDS protection is associated with a 1.7 percentage point decrease in the proportion of out-of-state applicants (column 9.F). Relative to the sample mean, this effect represents a 7% decrease in the proportion of out-of-state applicants.

The reduction in out-of-state applications has strategic implications for distressed firms. Out-of-state applicants are particularly valuable to firms when local workers lack the skills required for open positions. Distress appears to constrain firms' ability to attract workers from the national labor market, potentially preventing them from hiring workers with the appropriate skills. This challenge in accumulating human capital may contribute to distressed firms' struggles to regain financial stability.

Together, the results exploiting variation in unemployment costs and relocation costs suggest that workers' labor supply indeed responds to firms' financial health. We conclude that the decrease in job applications to distressed firms at least partially reflects worker preferences, not strictly changes to firms' labor demand.

5. Potential implications for firms' human capital

The negative effect of corporate distress on labor supply has potential implications for distressed firms' human capital accumulation and retention. Although a full examination of these issues is beyond the scope of our data, further analysis provides some indication of how the quality of the applicant pool changes with firm distress, which positions are most affected, and whether current employees' labor supply also decreases.

5.1 Quality of the applicant pool

Distress may affect not only the volume but also the quality of applicants to open positions in the firm. In deciding whether to apply, potential job applicants balance the expected value of a new position against their alternatives in the broader labor market. When a potential employer becomes distressed, the increased risk of unemployment lowers the value of working for the firm. The analyses in Sections 3 and 4 confirm that fewer job seekers apply. This decline may be driven by applicants with better outside options; if potential applicants have similar risk aversion and unemployment costs, then workers with high outside options may not find it worthwhile to apply. This would decrease the quality of the applicant pool to positions at distressed firms. In theory, however, average quality may not decrease if higher quality workers experience lower costs of unemployment or are less risk averse.

To explore whether firms' distress affects the quality of job applicants to open positions, we match applicants' locations to ZIP code demographics from the 2000 United States Census. Unfortunately, we do not observe detailed characteristics of the specific applicants in our data. The job search platform does not archive the individual PDF resumes uploaded with each job application. Although the platform separately collects parsed resume information from some users, they were unable to match those data with many applications for the purposes of this research. Nevertheless, by examining applicants' ZIP codes, we gain some insight into their backgrounds.

Table 10 reports results of regressions using four measures of applicant quality. Columns 10.A and 10.B examine the natural logs of the mean and median of average earnings (for the population sixteen years and over with earnings) in applicants' ZIP codes; columns 10.C and 10.D examine the mean and median of the percentage of the population in applicants' ZIP codes

with at least a four-year college degree. As in Table 9, we limit our sample to job postings for which we observe at least 80% of the applicants' location. All regressions include firm and detailed job type-state-month fixed effects and are weighted by the number of applications for which location data are available.

The results suggest that distressed firms struggle to attract high-quality applicants to open positions. An increase in CDS price is associated with a statistically significant decline in applicants' ZIP codes' earnings—a rough measure of applicants' past earnings and ability. A $0.10 increase in the CDS price is associated with a 2 log point decline in ZIP code earnings (columns 10.A and 10.B; $p < 0.10$ and $p < 0.05$). An increase in CDS price is also associated with a decrease in the education of the applicant pool. A $0.10 increase in the CDS price is associated with a 7 to 11 percentage point reduction in applicants' ZIP codes' college completion rate—a 25% to 40% decrease relative to the sample mean of 27.6% (columns 10.C and 10.D; $p < 0.10$ and $p < 0.01$).

Section 3 shows that the volume of applications decreases in distress, and the results here suggest that the shrinking pool of applicants is also declining in quality. This finding highlights the potentially reinforcing nature of firm distress—poor performance may be exacerbated by a firm's inability to attract high-quality workers who can assist in its recovery.

5.2 Heterogeneity in human capital acquisition

Distress may not affect hiring for all positions equally—the volume of applications for some positions may be more sensitive to distress than others. Workers who suffer most from being laid off are likely especially sensitive to job insecurity. These workers include, for example, people whose specific skills make it difficult to find a good match, jobs that require

firm-specific investments, and positions with steep wage-tenure profiles. Workers may also differ in their awareness of employers' financial health.

Irrespective of the underlying mechanisms, describing cross-worker heterogeneity in responsiveness to corporate distress can shed light on which types of human capital are most sensitive to firms' financial health. To this end, we divide job postings by educational requirements. Data on educational requirements are available for approximately 40% of the job postings. Of these, approximately 65% require a four-year college degree and 35% require only high school education.

The results are reported in Table 11. To save space, we report only specifications with our most demanding firm, month, location, and job-type controls. For lower-education jobs, the estimated coefficients for CDS price vary substantially across the specifications and are not statistically significant at conventional levels (columns 11.A through 11.C). In contrast, the coefficient estimates on the CDS price are negative, sizable and consistent in magnitude, and statistically significant for jobs requiring a college education. A \$0.10 increase in the CDS price is associated with a 21 to 28 log point decline in applications to jobs requiring a college degree ($p < 0.10$ and $p < 0.05$; columns 11.D through 11.F).

Comparing coefficient estimates across the two samples yields mixed results in different specifications. On one hand, analysis with firm, state-month, and detailed job type controls finds the effect of CDS price to be much larger for positions requiring college and the difference to be highly statistically significant ($p < 0.01$; columns 11.B and 11.E). On the other hand, analysis with the most saturated controls finds similar point estimates across the samples; there are large differences in precision, which is unsurprising given the difference in sample sizes (columns 11.D and 11.F). The differences in the estimates from the third specification are in between these

extremes. Overall, however, the relative sizes of the coefficients in Table 11 suggest that the effect identified in Table 5 may largely reflect the sensitivity of applicants pursuing jobs with high educational requirements.

We propose two potential explanations for why skilled workers may be more sensitive to firms' distress—highly educated workers may be more knowledgeable about firms' financial condition and/or they may expect to suffer greater costs in the case of corporate distress. Highly educated workers likely bear greater expected distress costs, in part, because of their steeper wage-tenure profiles (e.g., Connolly and Gottchalk 2006). Expected total job tenure also increases with education, further magnifying potential losses due to corporate distress (Topel 1991; Topel and Ward 1992).

Multiple underlying models can explain the differential wage-tenure profiles. First, the firms could be using deferred compensation, whereby firms pay senior employees more than their marginal product and junior employees less in order to motivate workers early in their tenure (Lazear 1979). Such schemes rely on the continued solvency of the firm. If jobs requiring more education are also ones with established "career paths" and steep seniority-wage profiles, then workers qualified for those positions may be reluctant to apply when the firm's future is uncertain. Second, the differential wage-tenure profiles may be supported by specialized investments in human capital. Applicants seeking jobs that require greater investment in firm-specific human capital face higher unemployment costs. Uncertainty over the future health of the firm also makes such investment unattractive to new employees. Consequently, investment in human capital declines when workers face possible separation from the firm (Jovanovic 1979).

More educated job seekers may also be more informed about, and therefore more sensitive to, firms' financial health. In our empirical context—the financial services industry—

the positions requiring higher education include jobs relating directly to corporate finance, capital markets, and investing. As these job listings target applicants with an interest and aptitude in finance and related fields, these individuals may be more aware of firms' financial condition. In contrast, the positions that do not require advanced education may attract applicants with more limited knowledge or interest in current events in business.

Although we cannot tease apart these potential mechanisms, our empirical findings suggest that jobs with more demanding educational requirements may attract even fewer applications when firms are distressed. Distressed firms thus face particularly acute challenges in recruiting for skilled positions, likely impeding these firms' accumulation of human capital.

5.3 Human capital retention

To shed light on distressed firms' ability to retain talent, in a final analysis, we examine firms' total number of employees and job postings. Over the study period, distressed firms reduced their total workforces and reduced them by more than other firms. The first two columns of Table 12 report results from an analysis of employment data from Compustat, which are available only on an annual basis. First, we regress the percentage change in a firm's number of employees from December 2007 to December 2009 on the firm's maximum CDS price in that period. As reported in column 12.A, the coefficient on the CDS price is negative and statistically significant—a $0.10 increase in the maximum CDS price for $1 of protection is associated with an 11% decline in the number of workers in the firm over the two years ($p < 0.05$). Distressed firms are also more likely to experience any cuts in their workforce. In the analysis reported in column 12.B, we examine the impact of distress on an indicator for negative net labor force growth over the two-year period. We find that a $0.10 increase in a firm's maximum CDS price

is associated with a nearly 20-percentage-point increase in the probability that the firm's labor force shrinks ($p < 0.05$).

The aggregate reductions in the labor force of distressed firms could reflect decreases in labor demand. After all, distressed firms are often forced to lay off employees to cut costs. But decreases in the supply of labor at distressed firms likely play a role in the aggregate reductions as well, if current employees leave for more secure jobs elsewhere and it is difficult to attract qualified new applicants. To shed light on this possibility, we examine the quantity of job postings in this period. If the reductions in employment are completely explained by decreases in labor demand, then we should observe a concomitant relative decline in the volume of job openings posted. If the relative number of positions posted does not decrease, then this suggests that distressed firms suffer greater attrition by current employees.

Table 12 also presents results from regressions examining the number of jobs posted. Looking over the entire sample period, the total number of jobs posted is positively related to a firm's maximum CDS price—a $0.10 increase in the maximum CDS price is associated with about six additional job postings over the 21-month period, although the effect is not statistically significant (column 12.C). Because we observe the precise timing of job postings, further analysis is also possible. Using firm-month panel data, we regress an indicator for whether any positions are posted (column 12.D) or the log of the number of positions (conditional on any posting; column 12.E) on firms' contemporaneous CDS prices and firm and month fixed effects. The month fixed effects control for aggregate movements in job postings, including the precipitous drop after October 2008 depicted in Figure 4. The coefficient estimate is positive for both dependent variables and is significantly different than zero for the number of positions posted—a $0.10 increase in the CDS price is associated with a 20 log point increase in the

number of postings ($p < 0.10$; column 12.E). None of these three estimates show any indication of a relative decrease in recruiting, despite the firms' contemporaneous decrease in total employment.

Put together, distressed firms' overall decline in employment and lack of decrease in hiring suggest that these firms experience greater employee turnover. In periods of weak corporate financials, current workers facing uncertain job security may search for more stable work elsewhere. Our previous analyses found that new job seekers were less likely to be attracted to distressed firms; the results presented in Table 12 suggest that a similar attitude may prevail among current employees—in their case, a reluctance to remain aboard a sinking ship. Distressed firms appear to actively recruit to offset the loss of current employees, but these firms face a human resource challenge: as our evidence suggests, finding workers to fill vacancies can be particularly difficult just when the firm needs them the most.

6. Conclusion

Using several unique datasets from a large online job search platform, we find that the volume and quality of applicants attracted to open job postings decline when firms become distressed. Evidence suggests that shifts in labor demand cannot fully explain the decline in applications—the results hold for same-job analysis, and advertised salaries, if anything, increase. Instead, the decline appears to be at least partly driven by changes in labor supply. Indeed, we confirm that job seekers accurately perceive deterioration in individual firms' financials. Heterogeneity in the sensitivity of applications to firms' distress also supports the importance of changes in labor supply: applications decrease most among workers facing greater upfront costs because they must relocate from out of the state and among workers with less

protection provided by state unemployment insurance. Although UI is well known to undermine unemployed individuals' incentives for job search (Nicholson and Needels 2006), our results suggest that UI can also encourage employment by providing a safety net.

Although it is impossible to quantify the impact of these effects on firms' profitability, one likely implication is that distress reinforces distress—a struggling firm may be unable to retain and attract workers who could contribute to recovery. These challenges may be magnified in a recession when unemployment costs are all the more salient to workers. Distress reduces firms' access to the national labor market, reduces the quality of the applicant pool, and makes it particularly challenging to recruit for jobs with demanding educational requirements.

More broadly, our results imply that labor market frictions are an important consideration for corporate decisions related to risk taking—decisions including financial, operational, innovation, and growth strategies. The labor-related costs that we study provide firms with a strong incentive to avoid financial distress. Firms can abate these costs in various ways. Most directly, firm can reduce leverage and choose more conservative financial policies (Titman 1984; Berk, Stanton, and Zechner 2010; Agrawal and Matsa 2012). Firms can also reduce the probability of distress by reducing operating leverage (Lev 1974) or by taking less risky projects (Hennessy and Whited 2005), or can mitigate workers' costs of distress by redesigning job tasks to require fewer firm-specific skills (Jaggia and Thakor 1994). Exploring the impact of labor market frictions on such corporate strategies is an important area for future research.

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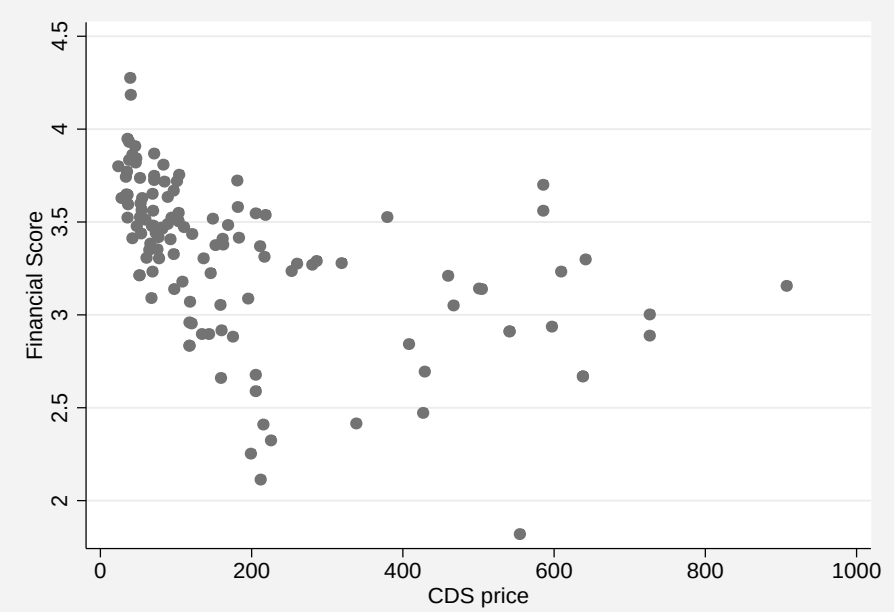
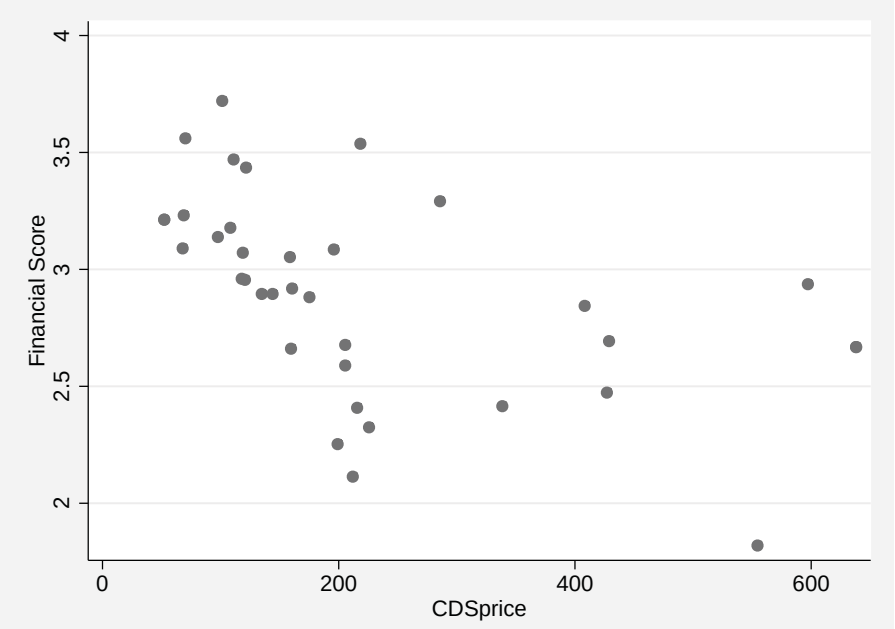
Figure 1 - Firms' Financial Scores and CDS Prices

Panel A: All firms

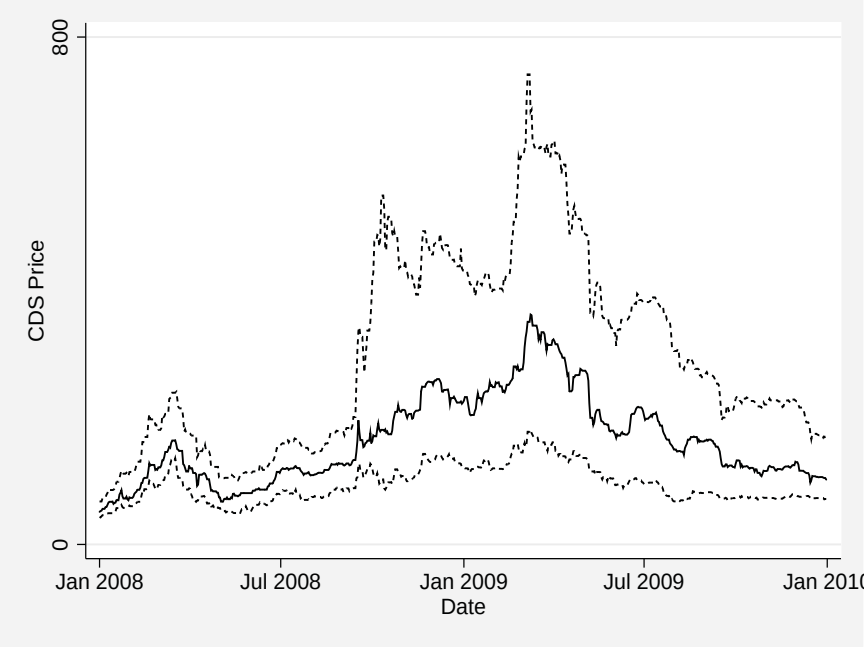


Panel B: Firms in financial industry



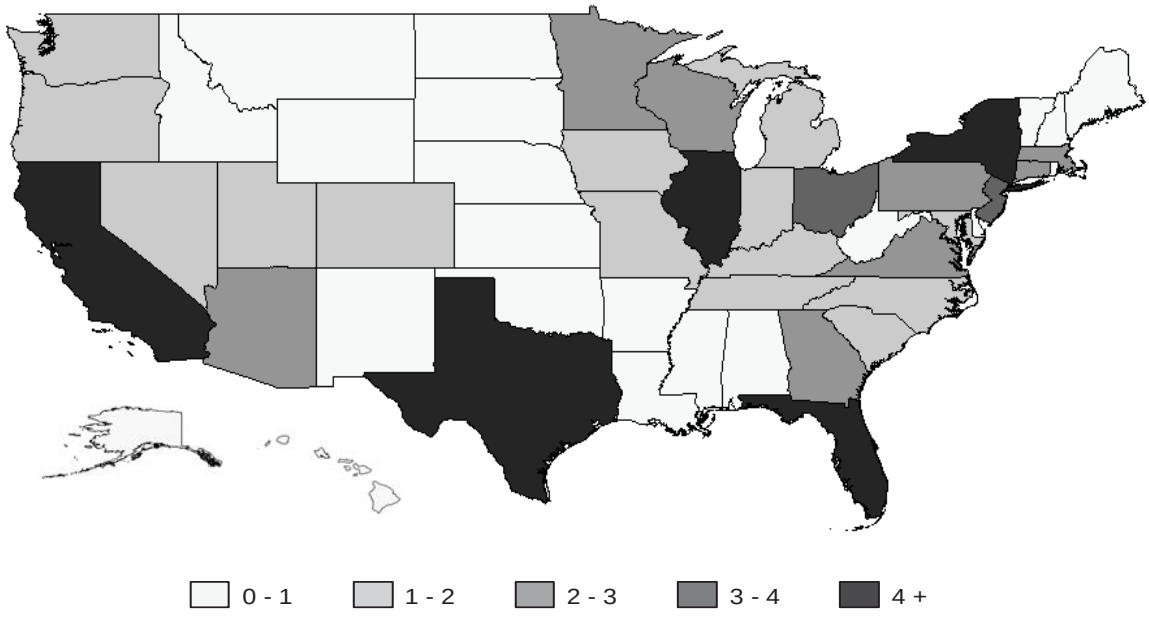
Notes: The figure reports average survey responses, scored from 1 ("weak performance") to 5 ("strong performance). CDS price is per $10,000 in CDS protection on the survey date. Panel A includes 126 observations for which survey data and CDS prices are available; Panel B includes only the 37 of these observations that are for firms in the financial industry. To conceal firms' identities, this figure includes only firms with CDS prices below 1,000.

Figure 2 - Daily CDS Prices for Large Financial Firms



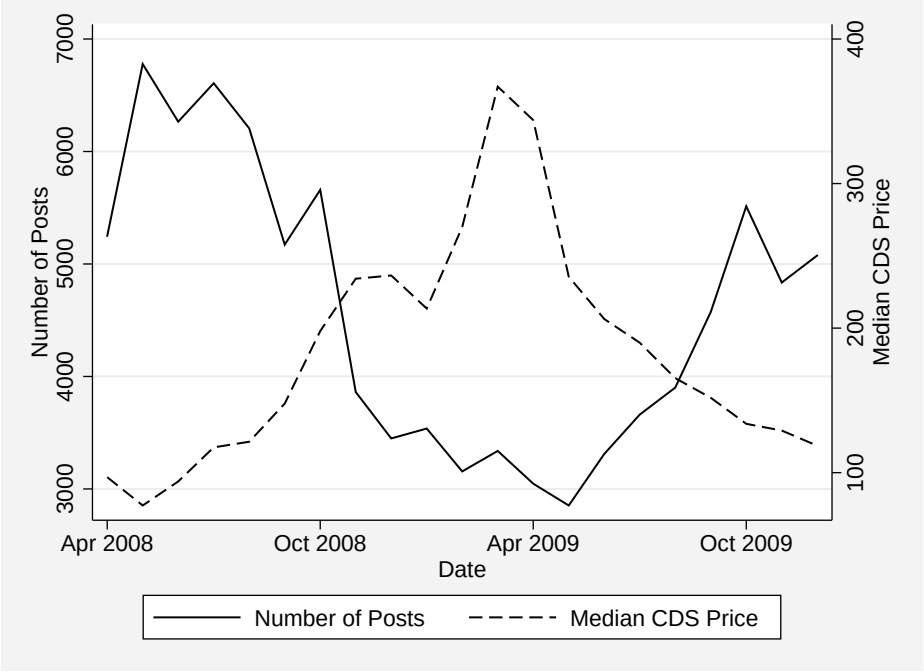
Notes: The figure reports the 25th percentile, median, and 75th percentile daily CDS prices for the 99 firms in the financial services industry (including banks, investment firms and insurance companies) with total assets in excess of $25 billion and for which CDS prices are available. CDS price is per $10,000 in CDS protection.

Figure 3 - Distribution of Job Postings By State



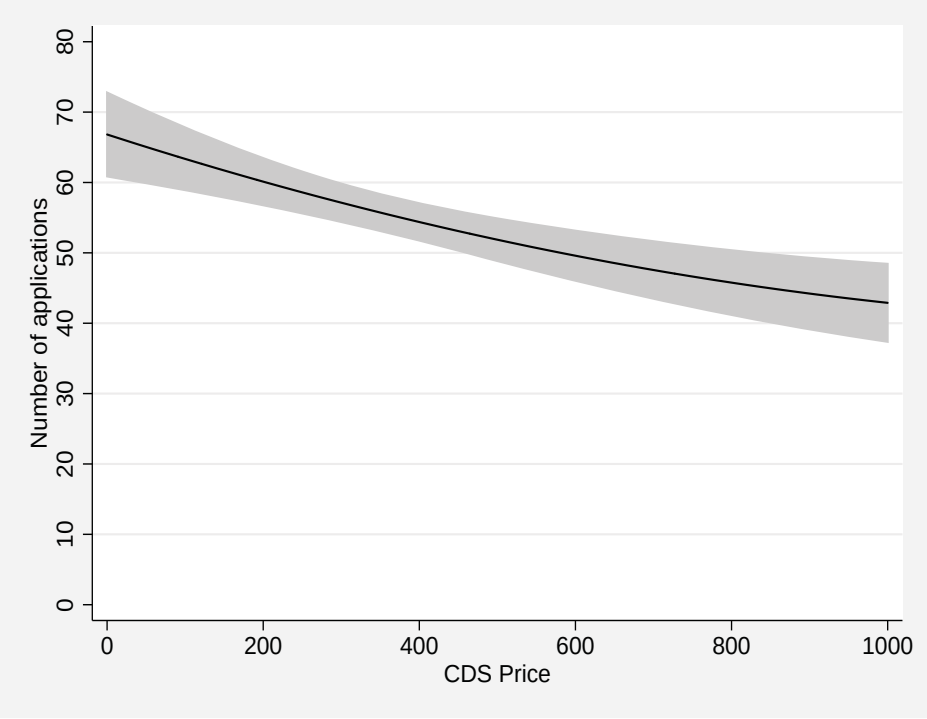
Notes: This figure displays the geographic distribution of job postings. The positions, many of which are in retail branches, are spread across all fifty U.S. states roughly in proportion to population.

Figure 4 - Number of Jobs Posted by Month



Notes: The number of jobs posted is the sum total of all jobs posted to the online platform each month by the 40 financial services firms of interest. CDS price is per $10,000 in CDS protection.

Figure 5 - Number of applications and CDS Prices in October 2008



Notes: This figure plots the predicted number of applications per job posting in October 2008 as a quadratic function of the CDS price. The shaded area represented the 95% confidence interval for the prediction. CDS price is per $10,000 in CDS protection.

Table 1 - Survey Summary Statistics

Panel A: Surveys and respondents

# of unique firms	145
# of observations	194
# of observations with CDS prices	126

	# of obs.	*Mean*	*Std. dev.*
# of respondents	194	150.7	91.6
Financial score (1=v. weak … 5=v. strong)	194	3.3	0.4
Daily CDS price (for $10,000 in CDS protection)	126	242	319

Panel B: Firms in surveys (2008Q1)

	# of obs.	*Mean*	*Std. dev.*
Market cap (millions $)	124	31,974	54,067
Return on assets (%)	122	2.05	1.98
Sales growth (%)	134	11.16	25.83
Market-to-book ratio	124	1.65	0.81
Debt / Total assets	125	0.29	0.21

Panel C: Industry breakdown for survey firms

	# of firms
Accommodation and food services	10
Administrative and Support Services	4
Construction	3
Finance and insurance	30
Health care and social assistance	8
Information	17
Manufacturing	33
Other	2
Professional, scientific and technical services	10
Real estate, rental, and leasing	4
Retail trade	15
Transportation and warehousing	5
Wholesale trade	4

Notes: Panel B includes only firms for which Compustat data were available for Q1 of 2008. In Panel C, firms were classified based on two-digit NAICS codes in Compustat.

Table 2: CDS Prices and Firms' Financial Score

Panel A. All firms

Dependent variable: Average financial score

	2.A	2.B	2.C	2.D
CDS price	-5.32 ***	-5.48 ***	-5.77 ***	-6.06 ***
(for $1 CDS protection)	(1.54)	(1.32)	(1.55)	(1.14)
Fixed effects				
Industry (3-digit NAICS)		X		X
Quarter			X	X
R-squared	0.16	0.63	0.27	0.67
# of observations	126	126	126	126

Panel B. Financial industry firms only

Dependent variable: Average financial score

	2.E	2.F	2.G	2.H
CDS price	-7.38 ***	-7.46 ***	-9.39 ***	-9.36 ***
(for $1 CDS protection)	(2.32)	(2.77)	(1.96)	(2.38)
Fixed effects				
Industry (3-digit NAICS)		X		X
Quarter			X	X
R-squared	0.23	0.30	0.35	0.41
# of observations	37	37	37	37

Notes: Robust standard errors are reported in parentheses.

*** $p < 0.01$

Table 3: Firms' Financial Score and Return on Assets, Sales Growth, and Market-to-Book Ratio

Panel A. All firms

Dependent variable: Average financial score	3.A	3.B	3.C	3.D
Return on assets (lagged 1 quarter)	2.69 ***			2.66 ***
	(0.76)			(0.67)
Sales growth (lagged 1 quarter)		0.29 *		
		(0.14)		
Market-to-book ratio (lagged 1 quarter)			0.17 ***	
			(0.05)	
CDS price (for $1 CDS protection)				-5.32 ***
				(0.95)
Fixed effects				
Industry (3-digit NAICS)	X	X	X	X
Quarter	X	X	X	X
R-squared	0.58	0.53	0.52	0.78
# of observations	162	180	167	103

Panel B. Financial industry firms only

Dependent variable: Average financial score	3.E	3.F	3.G	3.H
Return on assets (lagged 1 quarter)	23.28 ***			24.08 **
	(4.77)			(8.64)
Sales growth (lagged 1 quarter)		0.38 **		
		(0.16)		
Market-to-book ratio (lagged 1 quarter)			0.26 ***	
			(0.07)	
CDS price (for $1 CDS protection)				-4.94 ***
				(1.03)
Fixed effects				
Industry (3-digit NAICS)	X	X	X	X
Quarter	X	X	X	X
R-squared	0.50	0.41	0.45	0.62
# of observations	45	55	47	32

Notes: Robust standard errors are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 - Application Data Summary Statistics

# of firms	40			
# of weeks of available data	91			
# of job postings	96,065			
	# of obs.	*Mean*	*Std. dev.*	*Median*
# of jobs posted per firm over all weeks	40	2,401.6	3,687.5	659
# of jobs posted per week	91	1,055.7	330.6	976
# of jobs posted per firm per week	2,552	37.6	60.4	14
# of applications per job posting	96,065	57.7	111.1	28
# of applications per firm over all weeks	40	138,646.8	186,764.8	46,191
Daily CDS price (for $10,000 in CDS protection)	10,110	279	383	174

Table 5: CDS Prices and Applicant Counts

Dependent variable:	*ln(# of applicants)*					
	5.A	5.B	5.C	5.D	5.E	5.F
CDS price	-1.937 **	-1.784 **	-1.745 ***	-1.733 ***	-1.337 ***	-2.372 ***
(for $1 CDS protection)	(0.833)	(0.720)	(0.655)	(0.646)	(0.466)	(0.833)
Fixed effects						
Firm	X	X	X	X	X	X
Month	X	X				
State		X				
State-Month			X	X	X	
Job type				X		
Detailed job type					X	
Detailed job type-State-Month						X
R-squared	0.18	0.26	0.27	0.35	0.40	0.63
# of observations	96,065	96,065	96,065	96,065	96,065	96,065

Notes: Standard errors, adjusted for clustering at the firm level, are reported in parentheses.
** $p < 0.05$, *** $p < 0.01$

Table 6: Robustness Tests

Dependent variable:	*ln(# of applicants)*				*# of applicants*	*ln(# of applicants)*
	6.A	6.B	6.C	6.D	6.E	6.F
CDS price	-2.382 ***	-2.286 ***	-5.420 ***	-6.212 **	-56.089 *	
(for $1 CDS protection)	(0.835)	(0.777)	(1.790)	(2.550)	(31.519)	
ln(Stock price)						0.198 ***
						(0.045)
Winsorize						
Applicant count	1%	5%				
CDS price			1%	5%		
Fixed effects						
Firm	X	X	X	X	X	X
Detailed job type-State-Month	X	X	X	X	X	X
R-squared	0.63	0.62	0.63	0.63	0.63	0.64
# of observations	96,065	96,065	96,065	96,065	96,065	84,763

Notes: Standard errors, adjusted for clustering at the firm level, are reported in parentheses.
* p < 0.1, ** *p* < 0.05, *** *p* < 0.01

Table 7: CDS Prices, Applicant Counts, and Salaries

Dependent variable:	*ln(# of applicants)*			*ln(Average annual salary)*		
	7.A	7.B	7.C	7.D	7.E	7.F
CDS price	-1.125 **	-0.962 **	-1.045 ***	1.792 *	1.738 *	1.569
(for $1 CDS protection)	(0.470)	(0.489)	(0.416)	(0.946)	(0.911)	(1.050)
Fixed effects						
Firm	X			X		
Month			X			X
State-Month	X	X		X	X	
Job title	X			X		
Firm-Job title		X			X	
Firm-State-Job title			X			X
R-squared	0.72	0.76	0.80	0.98	0.98	0.99
# of observations	96,065	96,065	96,065	6,391	6,391	6,391

Notes: Standard errors, adjusted for clustering at the firm level, are reported in parentheses.
* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01

Table 8: CDS Prices, UI benefits, and Applicant Counts

Dependent variable:	*ln(# of applicants)*					
	8.A	8.B	8.C	8.D	8.E	8.F
CDS price	-1.915 **	-1.773 **	-1.706 ***	-1.693 ***	-1.300 ***	-2.233 ***
(for $1 CDS protection)	(0.829)	(0.738)	(0.663)	(0.656)	(0.472)	(0.872)
CDS price x ln(Max UI benefit)	2.915 **	2.982 **	4.857 ***	4.878 ***	4.674 ***	4.554 ***
	(1.320)	(1.320)	(1.416)	(1.239)	(1.144)	(1.426)
Fixed effects						
Firm	X	X	X	X	X	X
Month	X	X				
State		X				
State-Month			X	X	X	
Job type				X		
Detailed job type					X	
Detailed job type-State-Month						X
R-squared	0.19	0.26	0.27	0.35	0.40	0.63
# of observations	96,059	96,059	96,059	96,059	96,059	96,059

Notes: Max UI benefit is the state-specific maximum that a recipient can receive for a single unemployment spell; the variable is demeaned before it is interacted with the CDS price. Although not reported in the table, regression 8.A includes Max UI benefit (not interacted) as a control; in all other specifications, that estimate is absorbed by the state fixed effects. Standard errors, adjusted for clustering at the firm level, are reported in parentheses.

** $p < 0.05$, *** $p < 0.01$

Table 9: CDS Prices and Location of Applicants

Dependent variable:	*Percentage of applicants who live out of state*					
	9.A	9.B	9.C	9.D	9.E	9.F
CDS price	-18.42	-17.79 *	-16.95 **	-14.95 ***	-13.09 ***	-16.74 ***
(for $1 CDS protection)	(16.87)	(10.26)	(7.27)	(4.36)	(4.41)	(5.09)
Fixed effects						
Firm	X	X	X	X	X	X
Month	X	X				
State		X				
State-Month			X	X	X	
Job type				X		
Detailed job type					X	
Detailed job type-State-Month						X
R-squared	0.13	0.56	0.59	0.63	0.64	0.83
# of observations	46,031	46,031	46,031	46,031	46,031	46,031

Notes: Regressions include only jobs for which >80% of applicants have location information and are weighted by the number of applicants with location information. Standard errors, adjusted for clustering at the firm level, are reported in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: CDS Prices and Applicant Pool

Dependent variable:	*ln(Average applicant zipcode earnings)*	*ln(Median applicant zipcode earnings)*	*Average percentage of applicant zipcode with 4-year college degree*	*Median percentage of applicant zipcode with 4-year college degree*
	10.A	10.B	10.C	10.D
CDS price	-0.18 *	-0.23 **	-7.24 *	-11.49 ***
(for $1 CDS protection)	(0.11)	(0.10)	(4.12)	(4.08)
Fixed effects				
Firm	X	X	X	X
Detailed job type-State-Month	X	X	X	X
R-squared	0.76	0.73	0.74	0.71
# of observations	35,883	35,883	35,883	35,883

Notes: Regressions include only jobs for which >80% of applicants have census information and are weighted by the number of applicants with census information. Standard errors, adjusted for clustering at the firm level, are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: CDS Prices and Applicant Counts by Required Education

Dependent variable:	*ln(# of applicants)*					
	Jobs requiring high school or less			*Jobs requiring 4 -year college degree*		
	11.A	11.B	11.C	11.D	11.E	11.F
CDS price	-0.518	1.106	-2.288	-2.091 *	-2.808 **	-2.583 **
(for $1 CDS protection)	(1.537)	(1.029)	(2.121)	(1.129)	(1.246)	(1.313)
Fixed effects						
Firm	X	X	X	X	X	X
State-Month	X	X		X	X	
Job type	X			X		
Detailed job type		X			X	
Detailed job type-State-Month			X			X
R-squared	0.32	0.41	0.65	0.38	0.42	0.65
# of observations	11,802	11,802	11,802	25,193	25,193	25,193

Notes: Standard errors, adjusted for clustering at the firm level, are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$

Table 12: CDS Prices, Employment Changes, and the Volume of Job Postings

Dependent variable:	*% Change in firm's labor force (Dec. 2007–Dec. 2009)*	*Indicator for labor force reduction (Dec. 2007–Dec. 2009)*	*ln(total # of jobs posted, Apr. 2008–Dec. 2009)*	*Indicator if jobs posted per month > 0*	*ln(# of jobs posted per month)*
	12.A	12.B	12.C	12.D	12.E
Maximum CDS price, 2008–2009	-114.42 **	1.96 **	6.23		
(for $1 CDS protection)	(45.52)	(1.03)	(5.87)		
CDS price				0.38	1.96 *
(for $1 CDS protection)				(0.27)	(1.14)
Fixed effects					
Firm				X	X
Month				X	X
R-squared	0.15	0.09	0.03	0.61	0.89
# of observations	38	38	40	836	686

Notes: Columns 12.A and 12.B exclude two privately held firms for which employment data are not available. Standard errors, adjusted for clustering at the firm level in columns 12.D and 12.E, are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$