How do Firing Costs Affect Worker Flows in a World with Adverse Selection?*

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Abstract

This paper provides a theoretical and empirical analysis of a firing costs model with adverse selection. In a heterogeneous world, firms decide who to fire, so low-quality workers are more likely to be dismissed. Our theory suggests that as firing costs increase, firms may increasingly prefer to hire out of the pool of the employed, since the employed are less likely to be lemons. Estimates of re-employment and job-transition probabilities from the NLSY support this prediction. Unjust-dismissal provisions in U.S. states reduce the re-employment probabilities of unemployed workers but have little effect on job-transition rates for the employed. Consistent with a lemons story, the relative effects of unjust-dismissal provisions on the unemployed are generally smaller for union workers, who are subject to layoff-by-seniority rules, and for those who lost their previous jobs due the end of a contract.

Keywords: Adverse Selection, Dismissal Costs, Unemployment, Worker Flows, Matching Models, Discrimination.

Journal of Economic Literature Classification Codes: E24, J41, J63, J64, J65, J71.

1 Introduction

Job security regulations are widely believed to reduce firing and hiring. Reduced dismissal rates benefit employed workers, but reduced hiring rates hurt both the unemployed and those employed workers who would like to change jobs. The purpose of this paper is to present and test a theory which suggests that the reduction in hiring caused by firing costs can affect different groups of workers very differently. We show that the reduction in hiring is likely to be more severe for the unemployed than the employed. In a world with adverse selection, firing costs not only lengthen jobless-spells, they may also redistribute new employment opportunities from unemployed to employed workers.

The principal theoretical innovation in our paper is the introduction of adverse selection in a model of firing costs. A standard result in theoretical discussions of firing costs is that hiring and firing rates both fall when workers are protected (see, e.g., Bentolila and Bertola (1990) and Hopenhayn and Rogerson (1993)). Re-employment probabilities in models of adverse selection vary according to the type of separation (Gibbons and Katz (1991)). Our setup combines these features: worker quality is imperfectly observed, so firms must contend with the possibility of hiring a 'lemon' in addition to the possible expense of dismissal. When faced with an adverse shock, firms prefer dismissing bad workers who generate lower profits. As a result, in equilibrium, employed workers are more productive than the unemployed. Thus, firms concerned about firing costs will generally find it worthwhile to recruit new workers primarily from the pool of those already employed.

The central theoretical prediction of our model is that an increase in firing costs typically increases discrimination against unemployed job seekers. To test this model, we look at the effect of state unjust-dismissal provisions on the re-employment and job-transition probabilities of unemployed and employed workers using the NLSY. These data are useful for this purpose for three reasons. First, the NLSY allows us to identify job-to-job transitions. Second, we can identify employed and unemployed job seekers. Finally, the NLSY's Geocode file allows us to identify workers covered by unjust-dismissal provisions.

Our results show reduced re-employment probabilities for the unemployed but not for employed workers over the 1980's in states that introduced unjust-dismissal provisions. The results are unchanged when controlling for state and time effects, for time-specific and state-specific effects on the unemployed, for interactions between region and time effects, for unemployment benefit receipt, for differential welfare benefits across states, and for differential effects of other variables on unemployed and employed workers. Finally, we check if the relative effect on the unemployed is greater for nonunionized than unionized workers, since unionized jobs are covered by layoff-by-seniority rules, and for dismissed workers than for workers who are unemployed because of the end of a contract. As the lemons story suggests, our empirical findings generally confirm greater effects on nonunionized than unionized workers and on dismissed workers than on end-of-contract workers.

As indicated above, our paper relates to the literatures on adverse selection and firing costs. We extend the influential work on adverse selection of Gibbons and Katz (1991) by including firing costs. More recent asymmetric information models also appear in papers by Montgomery (1999), Canziani and Petrongolo (2001), and Strand (2000). In contrast to our paper, these papers only consider re-employment transitions for the unemployed and not for employed workers.

This paper also relates to the extensive literature that examines the link between firing costs and labor market performance. In contrast to firing costs models without adverse selection, our model predicts a shift in hiring from unemployed to employed workers. Moreover, our work relates to the extensive empirical literature on the impact of firing costs using macro- and micro-data.[1] Our paper shares the methodology with papers using micro-data and the state variation in unjust-dismissal provisions exploited by Autor (2000), Dertouzos and Karoly (1992), Hamermesh (1993), and Miles (2000). Finally, we contribute to the literature contrasting job search outcomes for employed and unemployed workers (e.g., Holzer,1988; Blau and Robbins,1990).

The paper is organized as follows. Section 2 presents and solves the matching model with asymmetric information and on-the-job search. Section 3 extends this model to allow for endogenous meeting rates. In Section 4, we describe the data and present estimates of the effect of dismissal costs on re-employment and job-transition probabilities of unemployed and employed workers. We conclude in Section 5.

[1] Studies using aggregate data include: Lazear (1990), Bertola (1990), and Di Tella and McCulloch (1999) among others. There are also a handful of studies examining the impact of firing costs using microdata.

2 The Model

2.1 Description of the Model

The theoretical framework is based on Mortensen and Pissarides (1994), where we simplify some aspects to preserve tractability but introduce dismissal costs, on-the-job search and adverse selection to capture the phenomena of interest. We show that in contrast to a world without adverse selection, firing costs not only reduce hiring and firing but they could also shift hiring from unemployed to employed workers.

The total labor force is split between two types of workers, 'good' and 'bad'. The proportion of 'good' workers is denoted by z, where the total labor force is normalized to 1. Prior to hiring, firms do not observe the quality of applicants nor their past labor history. They only observe the applicant's current employment status. Immediately after hiring, however, firms observe the productivity of the worker.[2]

Firms freely enter the market by creating vacant positions. Once the position is created, firms face a cost C of holding a vacancy. Because of free entry, the value of a vacancy must always be equal to 0 in equilibrium. A job seeker meets a vacant job with probability a per unit of time, which we take to be exogenous in this section but endogenize in the following section. When meeting a worker, a firm decides whether to hire a worker or not depending on his labor market status. Below, we only consider the case where employed job seekers are hired for sure, which must hold in any equilibrium of interest.[3]

Once a position is filled, production takes place. The firm's output per unit of time is $m+\eta$, where m is a match-specific component and η is worker-specific. We assume $\eta = \eta_H$ for good workers and $\eta = \eta_L < \eta_H$ for bad workers. When the match is initially formed the match-specific component is equal to $\bar{m}$, but with probability γ per unit of time the firm is hit by a

[2]This assumption is made for simplicity, as it reduces the number of individual states one has to keep track of. One could specify a learning process about the worker's productivity (as in Jovanovic, 1979), but since we are not dealing with learning aspects we keep this part of the model as simple as possible.

[3]As it will be clear below, the pool of employed job seekers is of higher quality than that of unemployed job seekers, thus generating higher net expected profits. If firms did not hire employed applicants with probability one, then these profits would be negative or zero, implying strictly negative net expected profits out of unemployed applicants. The exit rate from unemployment would then be zero, so that the whole workforce would be unemployed in equilibrium.

shock that changes the productivity of the match. Every time such a shock occurs, the new productivity is drawn from a distribution $G(m)$ over the interval $[\underline{m}, \bar{m}]$.

Wages are assumed to be equal to a base wage, $\bar{w}$, plus a constant fraction, φ, of output with worker productivity, η, and match productivity, m:

$$w(m, \eta) = \varphi(m + \eta) + (1 - \varphi)\bar{w}.$$

This assumption implies that firms make higher profits out of good workers than out of bad ones, which is central to our results.[4]

Production takes place until either the firm closes the position or the worker quits. Firms pay a tax F when dismissing a worker, which is paid to a third party. We specify firing costs as a tax because, as discussed below, a substantial fraction of firing costs go to third parties such as lawyers, insurers, and the government. In contrast, the firm does not have to pay F when the worker quits. The quit rate is endogenous and given by the probability of engaging in on-the-job search times the instantaneous probability of receiving an offer, a. Workers face a flow search cost, c, from searching on-the-job, but the benefit of searching is that they move to a match with the highest possible level of productivity. Whether the firm dismisses or the worker quits, the position is destroyed and the firm's value drops to zero.

2.2 Equilibrium

2.2.1 On-the-job Search

We first solve for on-the-job search, which is obtained by comparing the worker's value of being employed while searching and not searching. Let $E(m, \eta, NS)$ be the value of being employed while not searching for an employed worker of productivity η and match-specific productivity m. The value of the employed worker who does not search is given by the following Bellman equation,

[4] While this holds in a wide variety of models of wage formation (except for the perfectly competitive case, which equates wages to marginal product), the extent to which the results are affected by other assumptions about wage determination is left for future work.

$$
\begin{aligned}
rE\left(m,\eta,NS\right) \quad = \quad & \varphi(m+\eta)+(1-\varphi)\bar{w} \\
& +\gamma[\int_{m_c}^{\bar{m}} E(m,\eta)g(m)dm+G(m_c(\eta))U(\eta) \\
& -E\left(m,\eta,NS\right)], \qquad (1)
\end{aligned}
$$

where $U(\eta)$ is the value of an unemployed and m_c is the critical value of the match-specific productivity that triggers a dismissal, so the last term is the expected capital gain or loss from being hit by a shock. Similarly, the value of an employed job seeker is given by the following Bellman equation,

$$
\begin{aligned}
rE\left(m,\eta,S\right) \quad = \quad & \varphi(m+\eta)+(1-\varphi)\bar{w}-c+a\left[E\left(\bar{m},\eta\right)-E\left(m,\eta,S\right)\right] \\
& +\gamma[\int_{m_c}^{\bar{m}} E(m,\eta)g(m)dm+G(m_c(\eta))U(\eta) \\
& -E\left(m,\eta,S\right)], \qquad (2)
\end{aligned}
$$

where the fourth term represents the expected capital gain from quitting into a new job.

Search on-the-job for an employed with match-specific productivity, m, takes place if $E\left(m,\eta,S\right)\geq E\left(m,\eta,NS\right)$. Since the cost of search is constant and the benefit from searching is that the person moves from the current match to the highest possible match-specific productivity, then the gains from searching on-the-job increase as the current match level decreases. This means that on-the-job search is given up at the unique value, $\tilde{m}$, below which there is always on-the-job search, and which satisfies the condition,

$$E\left(\tilde{m},\eta,S\right)=E\left(\tilde{m},\eta,NS\right).$$

Substituting (1) and (2) into the above condition, we can solve for $\tilde{m}$ to obtain,

$$\tilde{m}=\bar{m}-\frac{\left(r+\gamma\right)c}{\varphi a},$$

which means that search behavior is independent of worker type. Since the case of interest is given by the case when some workers engage in search, we limit ourselves to the case when the search threshold exceeds the dismissal threshold, i.e., $\tilde{m}>m_c(\eta)$, for one or both type of workers.[5]

[5] Sufficient conditions for the search thresholds to exceed the dismissal thresholds are given in footnote 7.

2.2.2 Firing and Hiring Decisions

Given that the residual value of firing the worker is zero, the firm fires the worker if $J(m,\eta) < -F$. The value of a job filled with an employed job seeker of productivity η and match-specific productivity $m \leq \widehat{m}$, $J(m,\eta)$, is given by the following Bellman equation,

$$\begin{aligned} rJ(m,\eta) &= (1-\varphi)(m+\eta-\bar{w}) - aJ(m,\eta) \\ &\quad +\gamma \left[\int_{m_c}^{\bar{m}} J(m,\eta)g(m)dm - G(m_c(\eta))F - J(m,\eta) \right]. \end{aligned}$$

The second term in the RHS is the expected capital loss experienced by the firm if the worker quits, which conditional on on-the-job search happens with instantaneous probability a, and the last term is the expected capital gain or loss associated with a productivity shock. Solving for $J(m,\eta)$ we obtain,

$$J(m,\eta) = \frac{\gamma \widehat{J}(\eta) + (1-\varphi)(m+\eta-\bar{w})}{(r+\gamma+a)}, \tag{3}$$

where $\widehat{J}(\eta) = \int_{m_c}^{\bar{m}} J(m,\eta)g(m)dm - G(m_c(\eta))F$ is the average value of the match to the firm over the current value of the shock. Similarly, the value of a job filled with an employed worker who does not search, i.e., $m > \widehat{m}$, is,

$$J(m,\eta) = \frac{\gamma \widehat{J}(\eta) + (1-\varphi)(m+\eta-\bar{w})}{(r+\gamma)}.$$

Since we consider the case in which some workers search before reaching the dismissal threshold, i.e., $m_c(\eta) \leq \widehat{m}$, and the dismissal threshold is given by $J(m_c(\eta),\eta) = -F$, we obtain the following solution for the dismissal threshold,

$$m_c(\eta) = \frac{-F(r+\gamma+a) - (1-\varphi)\eta + (1-\varphi)\bar{w} - \gamma \widehat{J}(\eta)}{(1-\varphi)}, \tag{4}$$

which defines a relationship between $m_c(\eta)$ and $\widehat{J}(\eta)$.[6] Substituting (3) and

[6] Without on-the-job search, this relationship is given by,

$$m_c(\eta) = \frac{-F(r+\gamma) - (1-\varphi)\eta + (1-\varphi)\bar{w} - \gamma \widehat{J}(\eta)}{(1-\varphi)},$$

(4) into $\widetilde{J}(\eta)$ provides the other relationship between these two unknowns,

$$\widetilde{J}(\eta)=\frac{\left\{\int_{\widetilde{m}}^{\bar{m}}\frac{(1-\varphi)(m+\eta-\bar{w})}{(r+\gamma)}g(m)dm+\int_{m_c}^{\widetilde{m}}\frac{(1-\varphi)(m+\eta-\bar{w})}{(r+\gamma+a)}g(m)dm-FG(m_c(\eta))\right\}}{1-\frac{\gamma}{(r+\gamma)}\left[G(\bar{m})-G(\widetilde{m})\right]-\frac{\gamma}{(r+\gamma+a)}\left[G(\widetilde{m})-G(m_c(\eta))\right]},$$

and substituting this equation into (4) determines $m_c(\eta)$ uniquely.

Furthermore, m_c is falling with η, falling with F, and increasing with $\bar{w}$. This means that $m_c(\eta_L) > m_c(\eta_H)$, so that we may have two cases with on-the-job search: (a) only some workers search, i.e., $m_c(\eta_L) > \widetilde{m} \geq m_c(\eta_H)$, in which case only good workers search, or (b) both types of workers search, i.e., $\widetilde{m} \geq m_c(\eta_L) > m_c(\eta_H)$. We consider the second case which is the least restrictive one, although our results below are strengthened under the first case.[7] Moreover, the dismissal threshold of good workers is more responsive to changes in F and $\bar{w}$ than the dismissal threshold of bad workers. Consequently, $\left|\frac{dm_c(\eta_L)}{dF}\right| < \left|\frac{dm_c(\eta_H)}{dF}\right|$ and $\left|\frac{dm_c(\eta_L)}{d\bar{w}}\right| < \left|\frac{dm_c(\eta_H)}{d\bar{w}}\right|$, which is due to a discount effect since good workers are less likely to be fired (see the Appendix for proof).

We now compute the hiring decision of a firm faced with an applicant. The quality of the applicant is unobservable, but his status is observable and provides a signal to the firm. Let z_e, respectively z_u, be the proportion of good workers among employed, respectively unemployed, job seekers. Then,

indicating that on-the-job search lowers the dismissal threshold. As in Saint-Paul (1995), firms faced with firing costs may prefer to use attrition and wait until workers quit rather than dismiss at a cost, F.

[7] The condition for both types of workers to engage in on-the-job search before reaching the dismissal threshold is given by,

$$\bar{m} > \frac{-F(r+\gamma+a)-(1-\varphi)\eta+(1-\varphi)\bar{w})-\gamma\widetilde{J}(\eta)}{(1-\varphi)}+\frac{(r+\gamma)c}{\varphi a}.$$

A sufficient condition for this to hold is,

$$\frac{(r+\gamma)c}{\varphi a} \leq \bar{m}+\frac{F(r+2\gamma)}{(1-\varphi)}+\eta_L-\bar{w}.$$

Similarly, a sufficient condition for good workers to engage in on-the -job search is,

$$\frac{(r+\gamma)c}{\varphi a} \leq \bar{m}+\frac{F(r+2\gamma)}{(1-\varphi)}+\eta_H-\bar{w}.$$

the expected present discounted values associated with hiring an employed and an unemployed applicant are,

$$\Pi_e = z_e J(\bar{m}, \eta_H) + (1 - z_e) J(\bar{m}, \eta_L), \tag{5}$$
$$\Pi_u = z_u J(\bar{m}, \eta_H) + (1 - z_u) J(\bar{m}, \eta_L). \tag{6}$$

Firms prefer to hire an employed applicant rather than an unemployed one, i.e., $\Pi_e > \Pi_u$, since good workers are dismissed less often than bad ones and, thus, $z_e > z_u$, and firms make more profits out of good workers, $J(\bar{m}, \eta_H) > J(\bar{m}, \eta_L)$.

The firm hires the worker if $\Pi_i > 0$, it does not hire if $\Pi_i < 0$, and it is indifferent if $\Pi_i = 0$. Letting p_u be the probability that an unemployed worker is hired, then the hiring behavior is represented in the (p_u, z_u) plane by the EB locus in Figure 1. If the economy is above the horizontal PP line, then $\Pi_u > 0$. In this case, all unemployed and employed applicants are hired. If the economy lies on PP, then $\Pi_e > \Pi_u = 0$.[8] In this case, all employed applicants are hired, while unemployed applicants are only hired with probability p_u and, thus, there is discrimination in hiring against the unemployed. The lower hiring rate of the unemployed relative to employed workers reflects statistical discrimination, since firms use employment status to predict productivity. If the economy lies on PP, the EB locus shifts upwards whenever one of the labor cost parameters, F or $\bar{w}$, increases. This is because any parameter change that reduces profits must be offset by an increase in the quality of unemployed applicants. Otherwise, the incentive to hire them would disappear (see Appendix for proof).

2.2.3 Steady State Analysis

We complete the joint determination of p_u and z_u by deriving a steady state relationship between the two. In steady state, inflows into unemployment must be equal to outflows for each group of workers. Letting u be the unemployment rate, then:

$$\gamma G_H(z - u z_u) = a p_u u z_u, \tag{7}$$
$$\gamma G_L(1 - z - u(1 - z_u)) = a p_u u (1 - z_u), \tag{8}$$

[8] We ignore the case where $\Pi_u < 0$, as it would imply a zero outflow from unemployment, so that all workers would be unemployed in steady state.

where $G_i = G(m_c(\eta_i))$, $i = H, L$, and $l_H = (z - uz_u)$ is total employment of good workers and $l_L = (1 - z - u(1 - z_u))$ is total employment of bad workers. Eliminating u between these two equations allows us to derive the following steady state relationship between p_u and z_u,

$$z_u = z\frac{\gamma + \frac{ap_u}{G_L}}{\gamma + ap_u(\frac{(1-z)}{G_H} + \frac{z}{G_L})}. \tag{9}$$

This equation determines the steady state (S-S) locus, which provides a condition between p_u and z_u that keeps the composition of employment and unemployment time invariant. The S-S locus is downward sloping, because a lower p_u, i.e., a lower exit rate from unemployment, makes the steady state composition of the unemployment pool more similar to its source population - i.e., the employed, who are of better quality.

The equilibrium is determined by the point where the S-S locus crosses the EB locus. Hiring discrimination against the unemployed (i.e., $p_u < 1$) arises whenever the S-S locus cuts the EB locus along its horizontal portion PP (see Figure 2a). The job finding rates of employed and unemployed job seekers are the same if the S-S locus cuts the EB locus from above (see Figure 2b).

The total number of employed job seekers is given by the fraction of good workers who search among all good workers plus the fraction of bad workers who search among all bad workers,

$$l_s = l_H\left(\frac{\bar{G} - G_H}{1 - G_H}\right) + l_L\left(\frac{\bar{G} - G_L}{1 - G_L}\right).$$

Consequently, using the steady state conditions, the proportion of good workers among employed job seekers is,

$$z_e = \frac{l_H\left(\frac{\bar{G} - G_H}{1 - G_H}\right)}{l_H\left(\frac{\bar{G} - G_H}{1 - G_H}\right) + l_L\left(\frac{\bar{G} - G_L}{1 - G_L}\right)}.$$

2.3 Effects of Firing Costs

The comparative statics relationship of interest is the effect of changes in firing costs, F, on the hiring of the unemployed. We have already seen that the EB locus shifts upwards when F increases. If the S-S locus did not move, the increase in firing costs would make firms choosier and would lead to greater discrimination of the unemployed, i.e., a fall in p_u. However, the S-S locus does move when F increases because it affects the firing margins $m_c(\eta_H)$ and $m_c(\eta_L)$. Both the inflow into unemployment of good and bad workers are reduced by firing costs. If the latter were reduced more than the former, then the quality of the unemployed would improve. However, if the inflow of bad workers was reduced more than the inflow of good workers, then the quality of the unemployed would worsen. The S-S locus could then move up or down. Proposition 1 shows that, under reasonable conditions about the distribution of the shocks, the S-S locus shifts down so that an increase in F unambiguously reduces p_u.

PROPOSITION 1 - If the distribution G satisfies the nonincreasing hazard property, i.e.,

$$\frac{g(m)}{G(m)} \text{ is nonincreasing with } m, \tag{10}$$

the S-S locus moves down when firing costs, F, increase.

Proposition 1 which is proved in the Appendix shows that, given hiring policies, an increase in firing costs decreases the job loss rate more for good than for bad workers and, therefore, worsens the quality of the unemployed. This comes from two effects. First, as shown above, the dismissal threshold is more sensitive for good workers because of lower discounting. Second, if the nonincreasing hazards assumption holds, a given change in the dismissal threshold has a greater relative effect on the number of people being fired the smaller that number.[9] Since fewer good workers are fired, their firing rate falls proportionately more than for bad workers, thus, reducing the average quality of job losers.

Figure 3 illustrates Proposition 1. Higher firing costs exacerbate discrimination in hiring against unemployed workers, both because firms require better unemployed applicants and because under (10) firing costs reduce the quality of job losers.[10] In this model with adverse selection, higher firing

[9] Of course, the nonincreasing hazard assumption need not hold, but it holds for a wide range of distributions, including the uniform distribution and any distribution that does not have an accentuated interior mode. Even when property (10) does not hold, we can still establish that, under reasonable conditions, discrimination against the unemployed disappears with low enough firing costs (see Appendix).

[10] In constrast, while an increase in wages also shifts the EB locus up, its effect on the S-S locus goes in the opposite direction of the effect of firing costs when the nonincreasing hazard assumption holds.

costs are likely to reduce job transition probabilities for unemployed but not for employed workers, for whom it is given by the exogenous instantaneous probability of receiving an offer, a. When a is made endogenous, as in the next section, the job finding rate of employed job seekers may also fall with F, but by less than the unemployed's. Furthermore, as shown below, the job-to-job flow may even go up with F as a greater fraction of the employed engage in on-the-job search.

3 Endogenous Meeting Rates

In this section, the meeting rate between firms and workers is now determined by firms' optimal choices about vacancies. In particular, total contacts between searching firms and workers are generated by a matching function,

$$h = m(v, u + l_s),$$

where v is the number of vacant jobs. Consequently, the arrival rate of offers and the arrival rates of employed and unemployed job seekers are,

$$\begin{aligned} a &= \frac{m(v, u + l_s)}{u + l_s} = m(\theta, 1), \\ \lambda_e &= \frac{l_s}{u + l_s}\frac{m(v, u + l_s)}{v} = \frac{l_s}{u + l_s}m(1, \frac{1}{\theta}) = \frac{l_s}{u + l_s}q(a), \qquad (11) \\ \lambda_u &= \frac{u}{u + l_s}\frac{m(v, u + l_s)}{v} = \frac{u}{u + l_s}m(1, \frac{1}{\theta}) = \frac{u}{u + l_s}q(a), \qquad (12) \end{aligned}$$

where $\theta = \frac{v}{u+l_s}$ and $q(a) = m(1, \frac{1}{\theta})$, with $q'(a) < 0$.

The number of vacant jobs is determined by the entry decision of firms, where the value of a vacancy V satisfies,

$$rV = -C + \lambda_e (\Pi_e - V) + \lambda_u p_u (\Pi_u - V). \qquad (13)$$

An equilibrium is a set of endogenous variables such that, in addition to the equilibrium conditions derived in the previous section, the equilibrium condition $V = 0$ holds. Hence, eliminating λ_e and λ_u, we have one additional endogenous variable, a, and one additional equilibrium condition.

In equilibrium, free entry implies that $V = 0$, and this free entry condition determines the total number of vacancies, v. Given the equilibrium value of a, the arrival rates and the number of vacancies can then be recursively computed using the preceding equations.

The following theorem (see proof in Appendix) tells us that an equilibrium always exists and that, when nontrivial, it is "well behaved."

THEOREM -

(i) Either there exists a zero employment equilibrium such that $a = 0$ and $u = 1$, or

(ii) there exists an equilibrium with $a > 0$, which is "stable" in the sense that the value of the firm is locally decreasing in a.

A sufficient condition for (i) to be ruled out is $zJ(\bar{m}, \eta_H) + (1 - z)J(\bar{m}, \eta_L) > 0$, where the J's are computed using $a = 0$. This means that $a = 0$ cannot be an equilibrium, since it would then be profitable for an atomistic firm to deviate by hiring an unemployed worker, who would never quit and is good with probability z. The last part of claim (ii) refers to the case where a is treated as exogenous, as in the previous section. This means that around the equilibrium value of a, the value of a vacancy, V, is negatively related to labor market tightness, a.

This stability property implies that any parameter shift which reduces the value of the firm given a, will reduce the equilibrium value of a. This is typically true of an increase in the firm's labor costs, F, $\bar{w}$, and φ. Since it is difficult to say more analytically, we turn to numerical simulations.

The simulation results, reported in Table 1, suggest the following conclusions:

1. For low values of F, low quality workers do not engage in on-the-job search because the threshold value of m at which they are fired is higher than the threshold value of m below which they search. In this zone, an increase in F increases a. In this zone, $p_u = 1$, and $z_e = 1$, as all employed job seekers are of good quality. The economy then moves to a zone where both types of workers search on the job as F increases. In this zone, p_u and a fall monotonically with F, and one eventually reaches a zone where $p_u < 1$.

2. For $F > 0.1$, the unemployment-to-job flow, which is equal to ap_u, falls with F, and its fall accelerates in the zone where $p_u < 1$, where both a and p_u fall in response to F.

3. The job-to-job flow is hump-shaped, as a result of two conflicting effects. First, an increase in firing costs widens the distribution of productivity levels among employed workers, thus increasing the proportion of employed workers engaged in on-the-job search. Second, it reduces a, thus reducing the job finding rate of all job seekers. Our simulations suggest that at low

firing costs the first effect dominates, while the second does at high firing costs.

4. The job loss rate monotonically decreases with F, as expected.

5. In the zone where $p_u = 1$, the quality of unemployed job seekers falls with F for $F > 0.2$. This is because under the conditions of Proposition 1 the inflow into unemployment is more responsive to F for good than for bad workers. In the zone where $p_u < 1$, the quality of the unemployed goes up with F, due to the mechanisms already explained in the previous section. The quality of employed job seekers follows a similar U-shaped pattern.

6. The unemployment rate, u, falls with F in the zone where $p_u = 1$, implying that the effect of a lower job loss rate is stronger than that of a lower job finding rate. The unemployment rate goes up in the zone where $p_u < 1$, where the job finding rate falls much more rapidly in response to F due to the downward adjustment of the discrimination parameter p_u.

Similar to the results with exogenous meeting rates, these results show that as firing costs rise, the job finding rates of the unemployed decrease relative to those of the employed.

4 The Impact of Dismissal Costs on Accession Rates

This section provides evidence on the impact of unjust-dismissal provisions in the U.S. on the re-employment and job-transition probabilities of unemployed and employed workers. Before turning to the data and the empirical analysis, we provide a description of the changes in firing costs in U.S. states over the 1970's and 1980's.[11]

4.1 Exceptions to Employment-at-will

Until the 1959 ruling by California's Appellate Court imposing restrictions on dismissals, the common-law rule known as the employment-at-will doctrine applied in all U.S. states. The employment-at-will doctrine determined that employers could "discharge or retain employees at-will for good cause or for no cause, or even for bad cause without thereby being guilty of an unlawful

[11] Much of the description on the evolution of the legal environment that follows is based on Autor (2000), Dertouzos and Karoly (1992), and Miles (2000).

act per se."[12] During the 1980's the U.S. experienced a sharp and probably unanticipated rise in the recognition of exceptions to employment-at-will, leaving only four out of the fifty-one states as strictly employment-at-will states by the 1990's.

The exceptions to at-will employment adopted during the last few decades in the U.S. can be grouped into three main categories: the implied contract doctrine, the public policy doctrine, and the covenant of good faith and fair dealing. The implied contract doctrine establishes that the employment relationship may be governed by implied contractual provisions restricting the ability of employers to terminate employees. The courts establish evidence of an implied contract from written and oral statements, employment practices and manuals, employees's length of service, and the general context of the employment relationship. While only six states had recognized the implied contract doctrine by 1981, by the 1990's forty two states had introduced exceptions to employment-at-will based on the implied contract rule.

Public policy exceptions bar employers from terminating employees for refusing to commit an act contrary to public policy or for committing an act protected by public policy. The public policy doctrine is usually defined to include only statutes. Only in a few cases, has it been applied more broadly to include regulations, administrative rules, and professional codes of ethics. For this reason, the public policy doctrine appears to be less restrictive to employers than the implied contract exception. The public policy doctrine was first recognized in 1959 by California, but it was only widely accepted by most states during the 1980's. By the 1990's, 42 states had recognized the public policy doctrine, but only eight of them in its broader form.

A third less-widely recognized exception is the covenant of good faith and fair dealing, which bars employers from dismissing workers in order to deprive them from earned benefits (e.g., pensions and bonuses). Many legal scholars have considered the covenant of good faith as being potentially the most far reaching of the three doctrines, in that it can imply that dismissal must always be for cause. However, in spite of the early recognition of this doctrine in 1974, only 12 other states had issued similar decisions in support of this exception by the 1990's.

There is little information on the actual costs imposed by these unjust dismissal exceptions. A study of wrongful discharge cases by Dertouzos et al. (1988) in California, however, reported average compensatory damages

[12] Payne v. Western & Atlantic Railroad (1884), Tenessee Supreme Court.

of \$388,500 and average legal fees of \$98,000 in cases where the defense won and \$220,000 in cases where the plaintiff won. The costs going to third parties (i.e., lawyers) suggest the importance of the firing tax component of dismissal costs.

In the empirical analysis that follows, we distinguish among the three types of exceptions. We construct the dismissal legislation variables using the classifications of the doctrines in Autor (2000) and checked the robustness of our results using the classification provided by Dertouzos and Karoly (1992).[13]

4.2 Data Description

We use the random sample of 6,111 individuals in the NLSY for the years 1979-84 and 1996. In these years employed workers were asked about their job search activities and, in particular, were asked whether they were looking for another job. This allows us to contrast employed and unemployed job seekers. The unemployed are defined in the usual way as individuals who did not work during the survey week and were looking for work or on layoff. Employed job seekers are defined as those individuals who worked during the survey week and were looking for work. These same definitions were used by Blau and Robbins (1990) and Holzer (1988) in studies of job search by employed and unemployed workers.

The NLSY work history file allows us to track employer-specific data and to correctly identify job-to-job transitions. For multiple job holders, the 'main job' was identified as the job in which the worker earned the most during that week. Moreover, since observations are defined by search spells of employed and unemployed workers, an individual worker can contribute more than one observation if, for example, the worker is unemployed during two or more sample years or if the worker is an employed job seeker in one sample year and unemployed in another. We eliminated the following observations from the sample: all observations with a real wage less than one 1979 dollar, workers in the public sector, persons serving in the military, agricultural workers, and the self-employed.[14] In addition, while the youngest person in

[13] Since the results using the Dertouzos and Karoly (1992) classification were almost identical to those using the classification provided by Autor (2000), we only present the results based on the latter.

[14] Workers in the public sector and the military are eliminated because we want to concentrate on workers hired by profit-making businesses. Agricultural workers are eliminated

the NLSY enters the sample at 14, we restrict our sample to workers 17 years of age or older. The oldest workers reach age 39 in our sample period.

Most importantly for our purposes, the Geocode file allows to generate the job security provision variables, as it identifies the state of residence of each individual at the time of the interview. The Geocode file contains the unemployment rate in the respondent's county of residence.

4.3 Descriptive Statistics

Simple comparisons show that workers covered by unjust-dismissal provisions have higher job-finding rates than uncovered workers. This can be seen in the first row of Table 2, which reports the job-finding probability of workers covered by exceptions to be 0.026 higher than for uncovered workers. As Table 3 shows, this difference comes from the higher job-finding rates of the employed covered by exceptions, but hides the lower job-finding rates of unemployed workers covered by exceptions. Other comparisons by unjust-dismissal status show broadly similar characteristics between the two groups of workers. For example, the overall proportion of searchers unemployed is 41.3% and slightly higher among those covered by exceptions than among those in employment-at-will states, but the difference is not statistically significant.[15]

To illustrate the differential impact of unjust-dismissal provisions on unemployed and employed job seekers, Table 3 presents a set of contrasts in accession rates between unemployed and employed individuals in adopting and non-adopting states. The first panel of Table 3 shows differences in average accession rates for workers in covered states (i.e., adopting states after adoption of the doctrines) and uncovered states (i.e., non-adopting states as well as adopting states before adoption), for unemployed and employed workers. For example, the first and second rows in the first column show that the average job-finding rate of unemployed workers in covered states is 0.503, while the average job-finding rate of unemployed workers in uncovered states is 0.53. The third row presents the difference in average job-finding

because these workers are likely to have seassonal contracts and unlikely to be subject to unjust-dismissal doctrines. The self-employed are eliminated because they are not subject to adverse selection problems.

[15]This implies that about 60% of searchers in our sample are employed. Statistics not shown in the table indicate that about 20% of employed workers search, with about equal proportions searching in covered and non-covered states.

rates between covered and uncovered workers. These results show that the average job-finding rate is 0.03 lower for unemployed workers and 0.05 higher for employed workers in adopting compared to non-adopting states. The last row in Panel A contrasts the difference in average job-finding rates between covered and uncovered workers for those employed and unemployed. The results show that the employed-unemployed difference in average job-finding rates increased for workers living in states that introduced unjust-dismissal exceptions relative to the control group living in non-adopting states.

Panels B, C, and D show similar estimates for unemployed and employed workers, where coverage status is defined for the implied contract, public policy, and good faith doctrines separately. The results in the last row of Panels B, C, and D show that the employed-unemployed job-finding difference increased in those states that introduced each of these doctrines compared to those that did not.

4.4 Probit Estimates

To estimate the impact of unjust-dismissal exceptions on the re-employment probabilities of unemployed relative to employed workers while controlling for other variables, we estimate the following reduced-form probit model:

$$\begin{aligned}\Pr(y_{ijt} &= 1|x_{ijt}, u_{ijt-1}) = \Phi(\alpha' x_{ijt} + \tau_t + \theta_j + \delta u_{ijt-1} \\ &+\beta_{0t} u_{ijt-1} + \beta_{1j} u_{ijt-1} + \beta_2' d_{jt} + \beta_3' d_{jt} \times u_{ijt-1}),\end{aligned}$$

where the dependent variable y_{ijt} takes the value of one if an unemployed or employed worker was observed searching for a job at time $t-1$ and has found a job by the next calendar year and zero if he did not find a job within that calendar year. The vector x_{ijt} includes a set of individual controls for individual i living in state j at time t. The terms θ_j and τ_t are state and year effects, and u_{ijt-1} is an unemployment dummy which takes the value of 1 if the person was unemployed and the value of 0 if the person was employed and searching for another job at time $t-1$. The parameter β_{0t} captures differences in year effects by employment status and β_{1j} captures differences in state effects by employment status. The set of dummies, d_{jt}, indicate coverage by the three unjust-dismissal exceptions, which take the value of 1 if the individual is observed living in a state j that has adopted the implied contract, public policy, or good faith exceptions at time t and zero otherwise.

The vector β_2 thus measures the direct impact of unjust-dismissal exceptions on employed workers. Finally, the vector β_3 measures the differential impact of unjust-dismissal exceptions on the unemployed relative to employed workers.

Table 4 presents estimates from the probit of the direct impact of unjust-dismissal exceptions on employed workers and their relative impact on the unemployed, β_2 and β_3, as well as the impact of unemployment status on job-finding probabilities, δ. The first four columns of Table 4 present the results for the probit with basic controls.[16] The coefficient β_3 in Column (1) shows that the implied contract exception reduces the job finding probability of unemployed workers by 0.175 relative to employed workers. Columns (2) and (3) show smaller effects for unemployed relative to employed workers covered by the public policy and good faith doctrines, 0.091 and 0.073 respectively. Column (4) shows similar results when all three exceptions are included.[17] These results also indicate that the job-finding probability of unemployed workers is about 0.4 higher than for employed workers.

Columns (5)-(8) in Table 4 show the results of the probits with the basic controls as well as all first-level and second-level main effects: time and state effects, and time-unemployed and state-unemployed interactions. Time effects are included to capture the possibility that the introduction of exceptions may have coincided with other changes that were instead responsible for the low job-finding rates. State effects are included because the exceptions may be capturing the low job-finding rates of workers in those states that introduced exceptions for reasons unrelated to the exceptions. The time-unemployed and state-unemployed interactions are included to control for time-specific and state-specific factors affecting the unemployed but unrelated to the unjust-dismissal doctrines. In addition, these probits include interaction between time and region effects to control for time-varying regional shocks that may affect accession rates. Columns (5) and (6) in Table 4 indicate smaller effects of the implied contract and public policy exceptions on the job-finding probability of the unemployed relative to employed

[16] The controls include: age, education, number of children, tenure, wage, non-wage income, local unemployment rate, dummies for race, sex, and marital status, a manufacturing dummy, a union dummy, and a white-collar dummy. The job related variables (i.e., tenure, wage, union, sector, and occupation) for the unemployed refer to their previous job.

[17] The estimates in Columns (1)-(4) are quite precise because these models omit main state and year effects.

workers, after controlling for time, state, time, and time-unemployed, state-unemployed and time-region interaction terms. Column (7), however, shows a larger effect of the good faith exception when all first-level and second-level terms are included, indicating that this exception reduces the job-finding probability of unemployed workers by 0.122. This corresponds to a reduction of about 23% in the unemployed's job-finding probability from 0.516 to 0.394. The results in Column (8), including all exceptions, show that the exceptions together reduced the job-finding probability of the unemployed by 0.161 relative to employed workers.

Columns (9)-(12) in Table 4 present results for the probits including the basic controls, all first- and second-level main effects, and also an unemployment benefit receipt variable. The unemployment benefit variable is included because the lower job-finding probability for the unemployed in states with exceptions may be capturing the higher propensity for the unemployed to claim benefits in these states. Column (9)-(12) show very similar effects of the exceptions after controlling for unemployment benefit receipt.

The results in Table 4 show a negative impact of dismissal costs on the job-finding probabilities of unemployed relative to employed workers. Our results are robust to the inclusion of time and state effects, time-specific and state-specific effects on the unemployed, time-region interactions and unemployment benefit receipt.[18]

Tables 5 and 6 present additional evidence consistent with the lemons story. Following Gibbons and Katz (1991), in Table 5 we examine the impact of dismissal costs on nonunion and union workers. Since firms have less discretion firing workers covered by collective-bargaining agreements, the lemons effect generated by dismissal costs should be smaller for union workers. Columns (1)-(4) in Table 5 show the results for the nonunion sub-

[18] To further probe the robustness of the results, we estimate probits which control for the maximum available welfare benefits (including AFDC benefits and food stamps) in a state at each point in time, since during this time period not only did unjust-dismissal legislation change differentially across states but also the generosity of welfare benefits. The results including welfare benefits are similar to those reported in Table 4 and even slightly larger. In addition, we estimate models allowing for differential effects of the basic controls on unemployed and employed workers. The magnitude of the effects is somewhat smaller but remains large and significant. Finally, we estimate analogous linear probability and logit models with and without individual fixed-effects. The resulting individual fixed-effects estimates are less precise but also suggest that the exceptions had large negative effects on the unemployed relative to employed workers.

sample and Columns (5)-(8) for the union sub-sample.[19] Consistent with a lemons story, the estimates suggest that the implied contract and public policy doctrines had larger effects on nonunionized than unionized workers.

Table 6 presents results by reason for separation. It is widely believed that firms use temporary contracts as a way of avoiding dismissal costs and also as a way of screening workers (see, e.g., Autor (2000, 2001)). One may thus expect for workers who have separated due to the end of one of these contracts to be stigmatized by unemployment in the same way dismissed workers are. At the same time, stigma effects should become less important for those under temporary contracts relative to those under permanent contracts as dismissal costs rise. As dismissal costs rise, firms will use more discretion in dismissing those under permanent contracts but not those under temporary contracts. Table 6 shows estimates of models including interactions with a dismissal dummy.[20] These results indicate higher job-finding probabilities of dismissed relative to end-of-contract workers in employment-at-will states, but smaller relative job-finding probabilities for dismissed workers covered by the exceptions.

5 Conclusion

The matching model with asymmetric information presented in this paper shows that firing costs are likely to generate hiring discrimination against the unemployed. This is true whether or not meeting rates are endogenous. Estimates using the NLSY indicate increased discrimination in hiring against the unemployed in the U.S. over the 1980's in those states that introduced exceptions to employment-at-will. These results are unchanged by including state and time effects, time-specific and state-specific effects on the unemployed, interactions between region and time effects, unemployment benefit receipt, and welfare benefits. Moreover, consistent with a lemons story, we find that the relative effect of the exceptions on the unemployed is generally

[19] There are too few observations in the union/good faith sample to be able to estimate the impact of the good faith doctrine on unionized workers.

[20] In this case, the sub-samples of dismissed and end-of-contract workers are too small for the completely separate analysis to be informative. Since our model does not make predictions about voluntary quitters into unemployment, we exclude them from our sample and consider only dismissed and end-of-contract workers. Effects on voluntary quitters are harder to interpret since this sort of exit may be taken as a signal of weak labor market attachment.

smaller for unionized workers, who are subject to layoff-by-seniority rules, and for those who lost their jobs due to an end-of-contract and, thus, are not subject to dismissal costs.

While our empirical analysis used U.S. data, the results also have implications for European labor markets. Since European countries have high dismissal costs compared to North-America, European firms should discriminate even more against unemployed job seekers. These predictions are consistent with the findings in Bertola and Rogerson (1997) and Boeri (1999), which show much lower flows into and out of unemployment but similar job-to-job flows in the two continents. Our paper suggests that employment protection legislation together with information asymmetries probably play an important role in explaining these differences.

References

[1] Acemoglu, Daron and Joshua Angrist. 2001. "Consequences of Employment Protection? The Case of the Americans with Disabilities Act," Journal of Political Economy, 109(5): 915-57.

[2] Aigner, Dennis and Glen Cain. 1977. "Statistical Theories of Discrimination in Labor Markets," Industrial and Labor Relations Review, 30(2): 175-187.

[3] Addison, John and Jean-Luc Grosso. 1996. "Job Security Provisions and Employment: Revised Estimates," Industrial Relations, 35: 585-603.

[4] Akerlof, George. 1970. "The Market for Lemons: Qualitative Uncertainty and the Market Mechanism," Quarterly Journal of Economics, 84: 488-500.

[5] __________, Andrew Rose and Janet Yellen. 1988. "Job Switching and Job Satisfaction in the U.S. Labor Market," Brookings Papers on Economic Activity, 2: 495-594.

[6] Alba, Alfonso. 1991. "Job Losses, Unemployment Duration, and New Jobs in Spain," Labour, 5(1): 23-43.

[7] _________ and Richard Freeman. 1990. "Jobfinding and Wages when Longrun Unemployment is Really Long: the Case of Spain," NBER Working Paper No.3409.

[8] Altonji, Joseph, and Charles Pierret. 2001. "Employer Learning and Statistical Discrimination," Quarterly Journal of Economics, 116(1): 313-50.

[9] Autor, David H. 2001. "Why do Temporary Help Firms Provide Free General Skills Training?," Quarterly Journal of Economics, 116(4): 1409-48.

[10] __________. 2000. "Outsourcing at Will: Unjust Dismissal Doctrine and the Growth of Temporary Help Employment," NBER Working Paper No.7557.

[11] Bentolila, Samuel and Giuseppe Bertola. 1990. "Firing Costs and Labor Demand: How Bad is Eurosclerosis?," Review of Economic Studies, 57: 381-402.

[12] Bertola, Giuseppe. 1990. "Job Security, Employment, and Wages," European Economic Review, 34: 851-886.

[13] Bertola, Giuseppe and Richard Rogerson. 1997. "Institutions and Labor Reallocation," European Economic Review, 41: 1147-1171.

[14] Boeri, Tito. 1999. "Enforcement of Employment Security Regulations, On-the job Search and Unemployment Duration," European Economic Review, 43(1): 65-89.

[15] Blau, David and Philip Robins. 1990. "Job Search Outcomes for the Employed and Unemployed," Journal of Political Economy, 98(3): 637-55.

[16] Burgess, Simon. 1993. "A Model of Competition between Unemployed and Employed Job Searchers: An Application to the Unemployment Outflow Rate in Britain," Economic Journal, 103(420): 1190-1204.

[17] ___________________. 1994. "Matching Models and Labour Market Flows," European Economic Review, 38(3-4): 809-816.

[18] Canziani, Patrizia and Barbara Petrongolo. 2001. "Firing Costs and Stigma: A Theoretical Analysis and Evidence from Microdata," European Economic Review, 45(10): 1877-1906.

[19] Dertouzos, James and Lynn Karoly. 1992. *Labor-Market Responses to Employer Liability*. Santa Monica: RAND.

[20] Di Tella, Rafael and Robert McCulloch. 1999. "The Consequences of Labour Market Flexibility: Panel Evidence Based on Survey Data," mimeo.

[21] Gibbons, Robert and Lawrence Katz. 1991. "Layoffs and Lemons," *Journal of Labor Economics*, 9(4): 351-80.

[22] Greenwald, Bruce. 1986. "Adverse Selection in the Labor Market," *Review of Economic Studies*, 53: 325-47.

[23] Grubb, David and William Wells. 1993. "Employment Regulation and Patterns of Work in EC Countries," *OECD Economic Studies*, No.21.

[24] Hamermesh, Daniel. 1993. "Employment Protection: Theoretical Implications and Some U.S. Evidence," in Cristoph Buechtermann, *Employment Security and Labour Market Behavior*. Ithaca, NY: ILR Press.

[25] Holzer, Harry J.. 1987. "Job Search by Employed and Unemployed Youth," *Industrial and Labor Relations Review*, 40(4): 601-11.

[26] Hopenhayn, Hugo and Richard Rogerson. 1993. "Job Turnover and Policy Evaluation: A General Equilibrium Analysis," *Journal of Political Economy*, 101(5): 915-938.

[27] Jovanovic, Boyan. 1979. "Job Matching and the Theory of Turnover," *Journal of Political Economy*, 87: 972-990.

[28] ____________________. 1984. "Matching, Turnover, and Unemployment," *Journal of Political Economy*, 92: 108-122.

[29] Krueger, Alan. 1991. "The Evolution of Unjust-Dismissal Legislation in the United States," *Industrial and Labor Relations Review*, 44(4): 644-60.

[30] Kugler, Adriana. 1999. "The Impact of Firing Costs on Turnover and Unemployment: Evidence from the Colombian Labour Market Reform," *International Tax and Public Finance Journal*, 6(3): 389-410.

[31] Laing, Derek. 1994. "Involuntary Layoffs in a Model with Asymmetric Information Concerning Worker Ability," Review of Economic Studies, 61(2): 375-92

[32] Lazear, Edward. 1990. "Job Security Provisions and Employment," Quarterly Journal of Economics, 105(3): 699-726.

[33] Levine, David I. 1991. "Just-Cause Employment Policies in the Presence of Worker Adverse Selection," Journal of Labor Economics, 9(3): 294-305.

[34] Machin, Steven and Alan Manning. 1999. "The Causes and Consequences of Long-term Unemployment in Europe," in O. Ashenfelter and D. Card, eds., Handbook of Labour Economics, Vol.3. Amsterdam: North-Holland.

[35] McCormick, Barry. 1990. "A Theory of Signalling during Job Search, Employment Efficiency, and 'Stigmatised' Jobs," Review of Economic Studies, 57(2): 299-313.

[36] Miles, Thomas. 2000. "Common Law Exceptions to Employment at Will and U.S. Labor Markets," Journal of Law, Economics, & Organization, 16(1):74-101.

[37] Mortensen, Dale and Christopher Pissarides. 1994. "Job Creation and Job Destruction in the Theory of Unemployment," Review of Economic Studies, 61(3): 397-415.

[38] Montgomery, James D.. 1999. "Adverse Selection and Employment Cycles," Journal of Labor Economics, 17(2): 281-97.

[39] Oyer, Paul and Scott Schaeffer. 2000. "Layoffs and Litigation," RAND Journal of Economics, 31(2): 345-58.

[40] __________________________. 1999. "Litigation Costs and Returns to Experience," mimeo.

[41] Pissarides, Christopher. 1994. "Search Unemployment with On-the-job Search," Review of Economic Studies, 61(3): 457-475.

[42] Royalty, Anne Beeson. 1998. “Job-to-Job and Job-to-Nonemployment Turnover by Gender and Education Level,” Journal of Labor Economics, 16(2): 392-443.

[43] Saint-Paul, Gilles. 1995. “The High Unemployment Trap,” Quarterly Journal of Economics, 110(2): 527-50.

[44] Strand, Jon. 2000. “Wage Bargaining and Turnover Costs with Heterogenous Labor and Asymmetric Information,” Labour Economics, 7(1): 95-116.

[45] Spence, Michael. 1973. “Job Market Signaling,” Quarterly Journal of Economics, 87(3): 355-374.

Appendix

PROPERTIES OF EQUATION (4) - The RHS of equation (4) is increasing in the dismissal threshold $m_c(\eta)$, so that equation (4) determines m_c uniquely. Totally differentiating equation (4) with respect to η, $\bar{w}$, and F we get,

$$
\begin{aligned}
\frac{dm_c}{d\eta} &= -1 - \frac{\gamma}{(1-\varphi)} \frac{d\widehat{J}(\eta)}{d\eta}, \\
\frac{dm_c}{d\bar{w}} &= 1 - \frac{\gamma}{(1-\varphi)} \frac{d\widehat{J}(\eta)}{d\bar{w}}, \\
\frac{dm_c}{dF} &= -\frac{(r+\gamma+a)}{(1-\varphi)} - \frac{\gamma}{(1-\varphi)} \frac{d\widehat{J}(\eta)}{dF},
\end{aligned}
$$

and differentiating equation (5) with respect to η, $\bar{w}$, and F and using the envelope theorem we obtain,

$$
\begin{aligned}
\frac{d\widehat{J}(\eta)}{d\eta} &= \frac{\left\{ \frac{(1-\varphi)}{(r+\gamma)} \left(G(\bar{m}) - G(\widetilde{m})\right) + \frac{(1-\varphi)}{(r+\gamma+a)} \left(G(\widetilde{m}) - G(m_c)\right) \right\}}{\left\{ 1 - \frac{\gamma}{(r+\gamma)} \left(G(\bar{m}) - G(\widetilde{m})\right) + \frac{\gamma}{(r+\gamma+a)} \left(G(\widetilde{m}) - G(m_c)\right) \right\}} > 0, \\
\frac{d\widehat{J}(\eta)}{d\bar{w}} &= -\frac{d\widehat{J}(\eta)}{d\eta} < 0, \\
\frac{d\widehat{J}(\eta)}{dF} &= \frac{-G(m_c(\eta))}{\left\{ 1 - \frac{\gamma}{(r+\gamma)} \left(G(\bar{m}) - G(\widetilde{m})\right) + \frac{\gamma}{(r+\gamma+a)} \left(G(\widetilde{m}) - G(m_c)\right) \right\}} < 0.
\end{aligned}
$$

Substituting these into the above equations, we obtain that, $\frac{dm_c}{d\eta} < 0$, $\frac{dm_c}{d\bar{w}} > 0$, and $\frac{dm_c}{dF} < 0$.

Furthermore, we can see that the dismissal threshold of good workers responds more to changes in labor costs than the dismissal threshold of bad workers. Given that $\frac{dm_c}{d\eta} < 0$ and, thus, $m_c(\eta_H) < m_c(\eta_L)$, then $0 > \frac{d\widehat{J}(\eta_H)}{dF} > \frac{d\widehat{J}(\eta_L)}{dF}$ and we get that,

$$
0 > \frac{dm_c\left(\eta_L\right)}{dF} > \frac{dm_c\left(\eta_H\right)}{dF}.
$$

Similarly, given that $m_c(\eta_H) < m_c(\eta_L)$, then $0 > \frac{d\widehat{J}(\eta_L)}{d\bar{w}} > \frac{d\widehat{J}(\eta_H)}{d\bar{w}}$ and,

$$\frac{dm_c\left(\eta_H\right)}{d\bar{w}} > \frac{dm_c\left(\eta_L\right)}{d\bar{w}} > 0,$$

which proves that there is a greater response of $m_c(\eta_H)$ than of $m_c(\eta_L)$ to changes in F and $\bar{w}$.

PROPERTIES OF EB - Π_u can be written as a function of z_u and the exogenous parameters of the model. $J(\bar{m}, \eta_H)$ and $J(\bar{m}, \eta_L)$ can be computed using (3) and substituting $\hat{J}(\eta)$, which only depends on $m_c(\eta)$ and on exogenous parameters. Given that $m_c(\eta)$ is a sole function of such parameters, Π_u can be written as a function of z_u and exogenous parameters,

$$\begin{aligned}
0 &= \Pi_u = z_u J(\bar{m}, \eta_H) + (1 - z_u) J(\bar{m}, \eta_L) \\
&= z_u [\frac{(1-\varphi)\left(\bar{m} + \eta_H - \bar{w}\right)}{(r+\gamma+a)} \\
&\quad + \frac{\gamma\left\{\int_{\tilde{m}}^{\bar{m}} \frac{(1-\varphi)(m+\eta_H - \bar{w})}{(r+\gamma)} g(m)dm + \int_{m_c(\eta_H)}^{\tilde{m}} \frac{(1-\varphi)(m+\eta_H-\bar{w})}{(r+\gamma+a)} g(m)dm - FG(m_c\left(\eta_H\right))\right\}}{(r+\gamma+a)\left\{1 - \frac{\gamma}{(r+\gamma)}\left[G(\bar{m}) - G(\tilde{m})\right] - \frac{\gamma}{(r+\gamma+a)}\left[G(\tilde{m}) - G(m_c\left(\eta_H\right))\right]\right\}}] \\
&\quad + (1 - z_u) [\frac{(1-\varphi)\left(\bar{m} + \eta_L - \bar{w}\right)}{(r+\gamma+a)} \\
&\quad + \frac{\gamma\left\{\int_{\tilde{m}}^{\bar{m}} \frac{(1-\varphi)(m+\eta_L - \bar{w})}{(r+\gamma)} g(m)dm + \int_{m_c(\eta_L)}^{\tilde{m}} \frac{(1-\varphi)(m+\eta_L-\bar{w})}{(r+\gamma+a)} g(m)dm - FG(m_c\left(\eta_L\right))\right\}}{(r+\gamma+a)\left\{1 - \frac{\gamma}{(r+\gamma)}\left[G(\bar{m}) - G(\tilde{m})\right] - \frac{\gamma}{(r+\gamma+a)}\left[G(\tilde{m}) - G(m_c\left(\eta_L\right))\right]\right\}}].
\end{aligned} \tag{14}$$

Furthermore, $\frac{\partial \Pi_u}{\partial z_u} = J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L) > 0$. Therefore, there exists a unique value of $\bar{z}_u$ such that the condition $\Pi_u = 0$ is satisfied. This defines a horizontal line PP, which delimits the plane between a region where $\Pi_u > 0$, in which case $p_u = 1$, and a region where $\Pi_u < 0$, in which case $p_u = 0$. This establishes the shape of the EB locus.

Next, totally differentiating (14), we obtain that the derivatives of the second and fourth terms in the brackets with respect to $m_c(\eta)$ are zero. Thus, the effects of F and $\bar{w}$ on z_u reduce to the direct effects of these parameters on profits,

$$\frac{dz_u}{dF} = \frac{\gamma\left[\frac{z_u G(m_c(\eta_H))}{D_H} + \frac{(1-z_u)G(m_c(\eta_L))}{D_L}\right]}{(r+\gamma+a)\left(J(\bar{m}, \eta_H) - J(\bar{m}, \eta_L)\right)} > 0,$$

$$\frac{dz_u}{d\bar{w}} = \frac{(1-\varphi)\left[\frac{z_u}{D_H} + \frac{(1-z_u)}{D_L}\right]}{(r+\gamma+a)\left(J(\bar{m},\eta_H) - J(\bar{m},\eta_L)\right)} > 0,$$

where $D_H = \left\{1 - \frac{\gamma}{(r+\gamma)}\left[G(\bar{m}) - G(\tilde{m})\right] - \frac{\gamma}{(r+\gamma+a)}\left[G(\tilde{m}) - G(m_c(\eta_H))\right]\right\}$ and $D_L = \left\{1 - \frac{\gamma}{(r+\gamma)}\left[G(\bar{m}) - G(\tilde{m})\right] - \frac{\gamma}{(r+\gamma+a)}\left[G(\tilde{m}) - G(m_c(\eta_L))\right]\right\}$.

PROOF THAT S-S IS DOWNWARD SLOPING - Differentiating equation (9) with respect to p_u, shows that the sign of the slope is equal to the sign of the following expression,

$$\frac{dz_u}{dp_u} \propto \gamma a z(1-z)\left(\frac{1}{G_L} - \frac{1}{G_H}\right),$$

which is negative since $G_H < G_L$. Q.E.D.

PROOF OF PROPOSITION 1 - Differentiating equation (9), while holding p_u constant, the direction of the move of the S-S locus in response to an increase in F is of the same sign as,

$$\begin{aligned}\frac{dz_u}{dF} \propto\ & -\gamma\left[\frac{g_L}{(G_L)^2}\frac{dm(\eta_L)}{dF} - \frac{g_H}{(G_H)^2}\frac{dm(\eta_H)}{dF}\right] \\ & -\frac{ap_u}{G_H G_L}\left[\frac{g_L}{G_L}\frac{dm(\eta_L)}{dF} - \frac{g_H}{G_H}\frac{dm(\eta_H)}{dF}\right],\end{aligned}$$

We know from the properties of equation (4) that $0 > \frac{dm_c(\eta_L)}{dF} > \frac{dm_c(\eta_H)}{dF}$. Thus, given that $G_L > G_H$ and the nonincreasing hazard assumption, $\frac{dz_u}{dF}$ is clearly negative. Q.E.D.

PROOF THAT IF F IS LOW ENOUGH, $p_u = 1$ - Assume $\bar{m} + \eta_H > \bar{w}$. This means that it is at least profitable for firms to employ good workers in the best possible state. At $F = 0$, one has $J(\bar{m},\eta_H) > -F = 0$ and $J(\bar{m},\eta_L) \geq -F = 0$, implying $\Pi_u > 0$ for all z_u. By continuity, this property holds in the neighborhood of $\bar{F} = 0$. Q.E.D.

PROOF OF THEOREM - Equation (13) is equivalent to

$$C = \lambda_e \Pi_e + \lambda_u p_u \Pi_u. \tag{15}$$

The equations of Section 2 as well as (11) and (12) determine, in a reduced form, the RHS of (15) as a function of a. Inspection of the relevant equations reveals that this function is continuous.[21] Call it $H(a)$. Next, note that as a

[21] Note that $J(m,\eta)$ has a discontinuity as m goes through $\tilde{m}$. However what intervenes in the determination of the RHS of (15) is $J(\bar{m},\eta)$, which is clearly continuous in a.

goes from any a_0 to infinity, the $\lambda's$ are bounded from above by $q(a_0)$, while (3) implies that Π_e and Π_u go to zero. Consequently,

$$\lim_{a\to\infty} H(a) = 0.$$

Finally, if $H(0) \leq C$, then there exists an equilibrium such that $a = 0$, $u = 1$, i.e. where no hiring is profitable. If not, then $H(0) > C$, in which case, by continuity, there exists an a such that $H(a) = C$ and $H(.)$ is locally decreasing around a. Q.E.D.

Figure 1: EB Locus

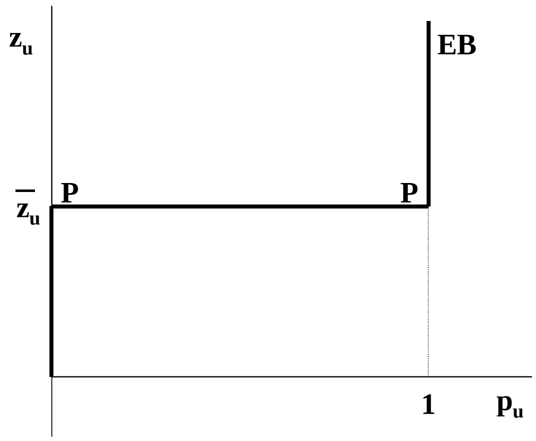

Figure 2.a: Equilibrium

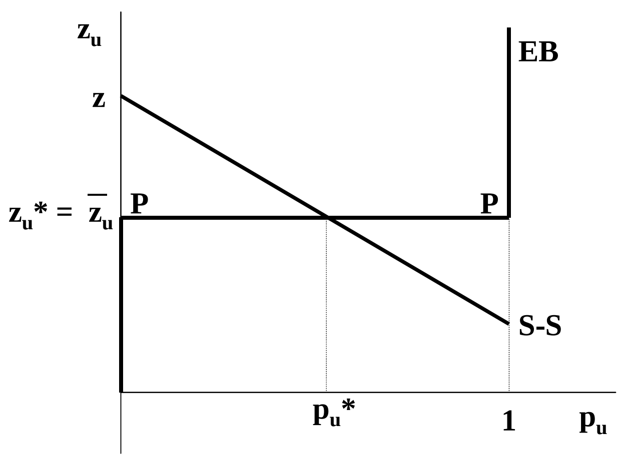

Figure 2.b: Equilibrium

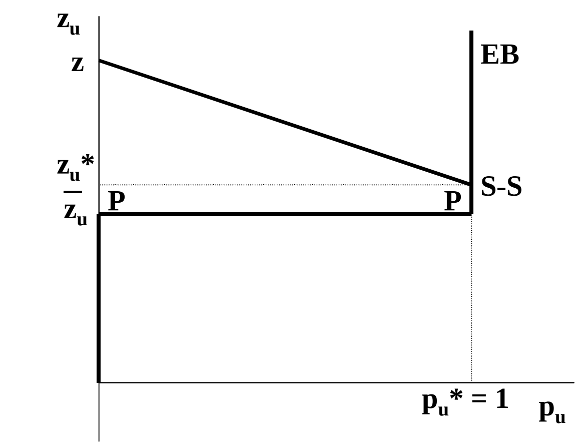

Figure 2.c: Equilibrium

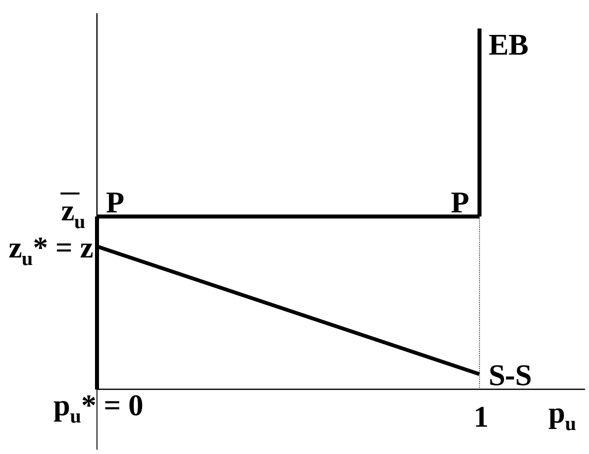

Figure 3.a: Comparative Statics of Increases in F

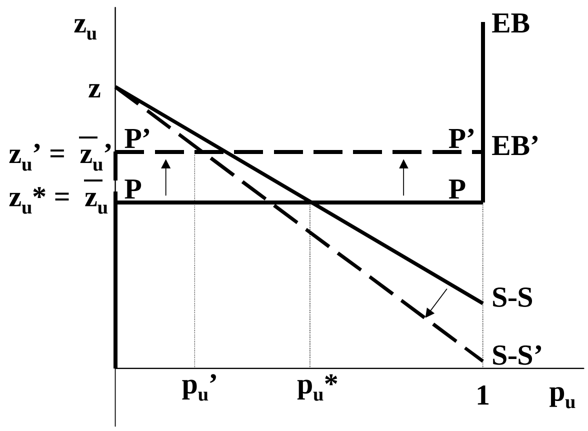

Figure 3.b: Comparative Statics of Reductions in F

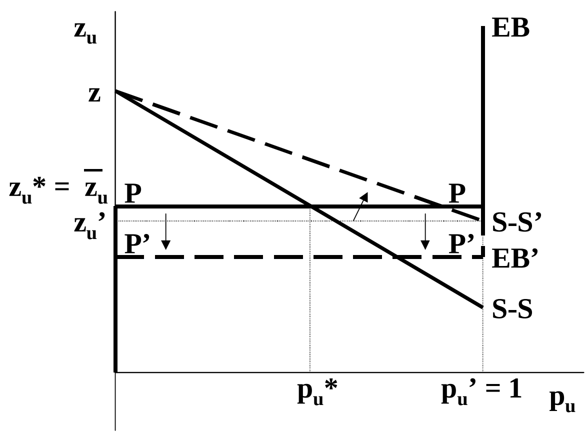

Table 1: Numerical Simulations of Effects of Firing Costs on Labor Market Flows

F	a	p_u	U-E	E-E	E-U	z_u	z_e	u
0	0.79	1	0.79	0.01	0.089	0.445	1	0.1
0.1	0.83	1	0.83	0.09	0.079	0.389	1	0.087
0.2	0.76	1	0.76	0.179	0.057	0.402	0.641	0.069
0.25	0.736	1	0.736	0.222	0.049	0.386	0.597	0.063
0.3	0.716	1	0.716	0.262	0.042	0.364	0.574	0.056
0.35	0.698	1	0.698	0.3	0.036	0.334	0.56	0.049
0.37	0.691	1	0.691	0.31	0.033	0.319	0.56	0.045
0.38	0.679	0.47	0.321	0.311	0.032	0.322	0.565	0.09
0.39	0.66	0.26	0.173	0.306	0.031	0.33	0.579	0.15
0.4	0.65	0.17	0.113	0.301	0.031	0.34	0.59	0.213
0.41	0.64	0.13	0.08	0.3	0.03	0.347	0.61	0.269
0.42	0.627	0.097	0.06	0.293	0.029	0.355	0.619	0.323
0.45	0.59	0.052	0.03	0.281	0.027	0.379	0.658	0.469

Notes: The set of parameters used for the simulation are as follows: $\gamma = 0.1$, $r = 0.05$, $\bar{m} = 1$, $\eta_H = 0.7$, $\eta_L = 0.5$, $\bar{w} = 1.5$, $z = 0.5$, $c = 0.5$, $C = 2.3$, $\varphi = 0.5$. The $q(\bullet)$ function was chosen as $q(a) = q_0 a^{-\delta}$, with $q_0 = 2$ and $\delta = 5$, and shocks are uniformly distributed over $[0, \bar{m}]$.

Table 2: Descriptive Statistics

Variable	Sample		
	Entire Sample	Covered by Exceptions	Not Covered by Exceptions
Searcher Found Job within a Year	0.328	0.339	0.313
Proportion of Searchers Unemployed	0.413	0.417	0.406
Age	22.259	22,982	21.077
	(4.556)	(5.075)	(3.324)
Male	0.589	0.591	0.586
White	0.681	0.726	0.616
Other Race	0.046	0.054	0.031
Married	0.221	0.239	0.191
No. of Children	0.447	0.535	0.335
	(0.877)	(0.984)	(0.705)
Education	12.082	12.201	11.876
	(1.94)	(1.952)	(1.886)
White-collar Worker	0.601	0.609	0.587
Manufacturing Sector	0.286	0.281	0.295
Union Member	0.163	0.165	0.159
Tenure	40.044	41.401	38.056
	(25.866)	(26.661)	(24.27)
Wage	520.8	566.4	446.3
	(474.9)	(546.3)	(323.7)
Non-wage Income	16,189	17,757.9	13,705.4
	(25,438)	(30,383.7)	(14,451.3)
Local	8.812	9.511	7.751
Unemployment Rate	(3.599)	(3.829)	(2.932)
N	4,776	2,918	1,858

Notes: The table reports means of all variables. The sample includes only unemployed workers and employed job searchers. The Covered column includes means for individuals in adopting states after the adoption of the doctrines. The Not Covered column includes means for individuals in non-adopting states and in adopting states before adoption. Standard deviations are in parentheses.

Table 3: Average Job Finding Rates

	Unemployed		Employed
A. All Exceptions			
Covered	0.503		0.22
	(0.01)		(0.007)
Uncovered	0.53		0.166
	(0.013)		(0.008)
Covered-Uncovered	-0.027		0.054
Differences	(0.016)		(0.01)
Unemployed-Employed		-0.081	
Difference in Differences		(0.019)	
B. Implicit Contract			
Covered	0.487		0.244
	(0.012)		(0.009)
Uncovered	0.531		0.171
	(0.01)		(0.006)
Covered-Uncovered	-0.044		0.073
Differences	(0.016)		(0.011)
Unemployed-Employed		-0.117	
Difference in Differences		(0.019)	
C. Public Policy			
Covered	0.505		0.225
	(0.011)		(0.008)
Uncovered	0.521		0.174
	(0.011)		(0.007)
Covered-Uncovered	-0.015		0.05
Differences	(0.015)		(0.01)
Unemployed-Employed		-0.066	
Difference in Differences		(0.019)	
D. Good Faith			
Covered	0.487		0.214
	(0.019)		(0.013)
Uncovered	0.519		0.194
	(0.008)		(0.006)
Covered-Uncovered	-0.032		0.02
Differences	(0.021)		(0.014)
Unemployed-Employed		-0.052	
Difference in Differences		(0.025)	

Notes: The first and second rows in each panel of the table report average job finding rates for unemployed and employed workers covered and not covered by unjust-dismissal doctrines. Covered workers are those living in adopting states after adoption and uncovered workers are those living in non-adopting states and in adopting states before adoption. The third and fourth rows in each panel report differences of the average job finding rates. Standard errors are in parenthesis.

Table 4: Job Finding Results

		Sample											
		Basic controls				Basic + main effects, and region x time				Basic + main effects, region x time and UI			
Exception	Regressor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Implied Contract	Effect on Employed	0.086 (0.005)			0.088 (0.009)	-0.013 (0.011)			-0.029 (0.03)	-0.009 (0.011)			-0.026 (0.034)
	Unemp. Interaction	-0.175 (0.001)			-0.174 (0.009)	-0.074 (0.033)			-0.062 (0.004)	-0.075 (0.039)			-0.06 (0.005)
Public Policy	Effect on Employed		0.064 (0.005)		0.046 (0.01)		0.059 (0.011)		0.069 (0.014)		0.069 (0.013)		0.077 (0.012)
	Unemp. Interaction		-0.091 (0.001)		-0.033 (0.01)		-0.032 (0.001)		-0.019 (0.019)		-0.048 (0.006)		-0.035 (0.021)
Good Faith	Effect on Employed			0.008 (0.006)	-0.053 (0.002)			-0.001 (0.009)	0.021 (0.016)			-0.001 (0.009)	0.021 (0.018)
	Unemp. Interaction			-0.073 (0.001)	0.046 (0.001)			-0.122 (0.048)	-0.099 (0.041)			-0.122 (0.048)	-0.114 (0.054)
Unemp. Main Effect		0.429 (0.025)	0.409 (0.028)	0.379 (0.01)	0.436 (0.018)	0.481 (0.247)	0.476 (0.365)	0.516 (0.172)	0.501 (0.433)	0.524 (0.21)	0.522 (0.327)	0.516 (0.172)	0.549 (0.39)

Notes: The table reports marginal effects from regressions of re-employment probabilities on the interaction terms and main effects listed in the regressor column. The interaction terms capture the effects of the exceptions on unemployed relative to employed workers. All models include: age, education, number of children, tenure, wage, non-wage income, local unemployment rate, a manufacturing dummy, a union dummy, a white-collar dummy, and dummies for race, sex, and marital status. Columns (5)-(8) include year effects, state effects, year-unemployed interactions, state-unemployed interactions, and region-time interactions. Column (9)-(12) include, in addition, an unemployment benefit receipt dummy. Robust standard errors are reported in parenthesis.

Table 5: Job Finding Results in Union and Non-union Samples

		Sample							
		Non-Union				Union			
Exception	Regressor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Implied Contract	Effect on Employed	0.089 (0.011)			0.083 (0.041)	-0.134 (0.018)			-0.173 (0.008)
	Unemployment Interaction	-0.195 (0.004)			-0.193 (0.002)	-0.127 (0.01)			-0.105 (0.026)
Public Policy	Effect on Employed		0.093 (0.03)		0.057 (0.022)		0.202 (0.151)		0.201 (0.008)
	Unemployment Interaction		-0.11 (0.003)		-0.041 (0.011)		-0.094 (0.036)		-0.057 (0.085)
Good Faith	Effect on Employed			-0.024 (0.025)	-0.076 (0.035)			-	-
	Unemployment Interaction			-0.078 (0.008)	0.053 (0.007)			-	-
Unemp. Main Effect		0.427 (0.03)	0.407 (0.035)	0.369 (0.024)	0.437 (0.04)	0.48 (0.014)	0.475 (0.05)	-	0.493 (0.11)
N		4,244	4,244	4,244	4,244	864	864	-	864

Notes: The table reports marginal effects from regressions of re-employment probabilities on the interaction terms and main effects listed in the regressor column. The interaction terms capture the effects of the exceptions on unemployed relative to employed workers. The models also include: age, education, number of children, tenure, hourly wage, non-wage income, local unemployment rate, a manufacturing dummy, a white-collar dummy, dummies for race, sex, and marital status, year effects, state effects, year-unemployed interactions, and state-unemployed interactions. The union/good faith sample is too small to allow estimation of the effects. Robust standard errors are reported in parenthesis.

Table 6: Job Finding Results by Reason for Separation

Regressor	Basic controls (1)	Basic + main effects (2)	Basic + main effects and UI (3)
Exception's Effect on	-0.001	-0.397	-0.392
Employed	(0.009)	(0.066)	(0.055)
Exception x Unemployment	0.041	0.438	0.443
Interaction	(0.009)	(0.137)	(0.122)
Exception x Dismissal	-0.024	-0.048	-0.05
Interaction	(0.027)	(0.021)	(0.02)
Unemployment Main Effect	-0.399	0.325	0.324
	(0-034)	(0.184)	(0.011)
Dismissal Main Effect	0.487	0.34	0.335
	(0.002)	(0.112)	(0.124)
N	790	768	768

Notes: The table reports marginal effects from regressions of re-employment probabilities on the interaction terms and main effects listed in the regressor column. The models also include: age, education, number of children, tenure, hourly wage, non-wage income, local unemployment rate, a manufacturing dummy, a white-collar dummy, a union dummy, dummies for race, sex, and marital status, year effects, state effects, year-unemployed interactions, and state-unemployed interactions. Robust standard errors are reported in parenthesis.