Does Employment Protection Create Its Own Political Support?

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September 2007

Abstract

This paper investigates the ability of employment protection to generate its own political support. A version of the Mortensen-Pissarides model is used for this purpose. Under the standard assumption of Nash bargaining, workers value employment protection because it strengthens their hand in bargaining. Workers in high productivity matches benefit most from higher wages as they expect to stay employed for longer. By reducing turnover employment protection shifts the distribution of match-specific productivity toward lower values. Thus stringent protection in the past actually reduces support for employment protection today. Introducing involuntary separations is a way of reversing this result. Now workers value employment protection because it delays involuntary dismissals. Workers in low productivity matches gain most since they face the highest risk of dismissal. The downward shift in the productivity distribution is now a shift towards ardent supporters of employment protection. In a calibration this mechanism sustains both low and high employment protection as stationary political outcomes. A survey of German employees provides support for employment protection being more strongly favored by workers likely to be dismissed.

Keywords: Employment Protection, Wage Determination, Mortensen-Pissarides model, Political Economy.

JEL Classification: E24, J41, J65

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Most countries have adopted regulations that make it costly for employers to dismiss workers. It is often argued that stringent employment protection has substantial adverse consequences for labor market performance. Economists along with organizations such as the OECD and the IMF routinely urge countries to relax employment protection regulations. However, policy makers have been reluctant to follow this advice, or have faced stiff political opposition when trying to do so.

A commonly invoked explanation for this failure to deregulate is the following: reform is difficult precisely because the current level of protection enjoyed by the employed is so high.[1]

According to this hypothesis, the fact that employment protection was stringent in the past induces employed workers to provide strong support for maintaining stringent protection into the future. Conversely, if protection was low in the past, then the employed show little support for introducing stronger protection, enabling countries such as the US to maintain flexible labor markets. If this hypothesis is correct, it may play an important role in accounting for the large and persistent differences in employment protection regulations across countries.[2]

This explanation is incomplete, however, since it is silent on why more stringent protection in the past generates stronger support for employment protection today. Specifically, if employment protection is beneficial to employed workers, why is it that employed workers in the US do not support it as much as their peers in Europe?[3]

This incompleteness is the point of departure for the present paper, which focuses precisely on mechanisms through which high protection in the past can generate strong support of employed workers for employment protection today.

As a starting point, it is useful to consider the following heuristic argument. Suppose an

[1]See the leader "The reason why Europe finds reform so hard is that insiders are too protected" in *The Economist (2006)* for a recent statement of this argument in the context of the conflict about the *Contrat première embauche (CPE)* in France. Writing on European unemployment, Becker (1998) argues "If the explanation of high European unemployment rates is so clear, why are those governments reluctant to reform their labor markets toward the so-called Anglo-Saxon model? Although many excuses and explanations have been offered, politics is the most powerful reason. Strong unions, 'insiders' with well-paying jobs, and other groups fight to hold on to their perks and privileges. The fear of losing these votes discourages even parties on the right from making major labor- market reforms."

[2]Heckman and Pagés (2000) estimate the expected cost of future dismissal at the time of hiring. They show that this measure varies greatly across countries. Blanchard and Wolfers (2000) construct a time series of the stringency of employment protection for a group of OECD countries, which display substantial persistence.

[3]This critique of incompleteness provides the staring point for the analysis of policy persistence in Coate and Morris (1999).

economy had very stringent employment protection in the past. This regulation maintains some employed workers in jobs that would be destroyed in its absence. If this economy were to remove employment protection, these workers would become unemployed. Thus this group of workers resists deregulation and may succeed in keeping stringent protection in place. In an otherwise identical country with low employment protection in the past, a group of workers whose employment depends on stringent protection has never been generated, allowing this country to maintain flexible labor markets.

The key implicit assumption in this heuristic argument is that workers who would be left unemployed by deregulation resist the reform. The main question of this paper is then the following: under what circumstances is this implicit assumption justified?

I approach this question using a version of the Mortensen-Pissarides model (Mortensen and Pissarides (1994), Pissarides (2000)). I chose this framework for two reasons. First, it is a standard tool for studying the effects of labor market policy — including employment protection — on labor market performance. Second, and more importantly, the first half of the heuristic argument is correct in this model under a wide variety of circumstances: employment protection maintains workers in relatively unproductive matches, and workers in these matches are unemployed if employment protection is deregulated.

With the first half of the argument in place, the only remaining question is: are the workers left unemployed by deregulation also opposed to it? In other words, are workers in good matches or workers in bad matches the primary beneficiaries of employment protection?

To provide an answer to this question, it is necessary to first take a step back and ask: why would employed workers support employment protection in the first place? I distinguish two channels through which workers can benefit from employment protection. First, it is frequently argued that by making it more difficult to dismiss the worker, employment protection strengthens workers' position in wage negotiations.[4] This I refer to as the *bargaining effect* of employment protection. Second, and perhaps more in line with the etymology of the term, if separations are involuntary to workers, then employment protection benefits workers by delaying such involuntary separations. This I refer to as the *job duration effect* of employment protection. Which of the two effects is present depends on how wages are determined and the interplay between wage setting and the separation decision.

I contrast two specific models of wage determination. The first, Nash bargaining, is most commonly employed in the Mortensen-Pissarides environment. It is useful to consider this

[4] See for example Lindbeck and Snower (1988) and Blanchard and Portugal (2001).

model of wage determination for two reasons. First, as mentioned above, the Mortensen-Pissarides model with Nash bargaining is widely used to study the implications of employment protection for labor market performance. Analyzing the structure of political support for employment protection in this environment is interesting in its own right. Second, it is useful analytically because it isolates one of the two channels through which workers gain from employment protection. Separations are bilaterally efficient, workers and firms agree on the timing of separations, hence separations are voluntary to workers. Thus the job duration effect is absent, leaving only the bargaining effect as a source of gains from employment protection.

With Nash bargaining, an increase in employment protection increases wages uniformly across levels of match specific productivity. Workers in good matches benefit relatively more because they expect to stay employed for longer. Thus they are the main beneficiaries of employment protection. But high protection in the past means fewer good matches today and thus lower support for future protection. In particular, workers left unemployed by deregulation benefit more from reform than other employed workers. They are stuck in bad matches, gaining relatively little from an enhanced bargaining position, and move into unemployment voluntarily after deregulation. This occurs because the reform stimulates hiring, making it easier to find a better match. Thus the heuristic argument fails in this environment.[5]

The second model of wage determination I consider is orthogonal to Nash bargaining in the following sense: separations are involuntary to workers, activating the job duration effect; but employment protection has no direct effect on wages, shutting down the bargaining effect. For the heuristic argument to be correct it must be that workers in poor matches, at least on average, gain relatively more from employment protection. I argue that this is a natural outcome if dismissals are involuntary. Intuitively, workers in good matches are already protected by their high productivity. Hence involuntary dismissal is a remote concern, and they have relatively little to gain from stronger employment protection. In contrast, workers in poor matches are closer to the separation margin and thus benefit more immediately from

[5] This argument extends beyond employment protection. Under Nash bargaining the worker receives a share β of the match surplus. Many authors assume that labor market regulation enhances the bargaining position of workers by increasing this share. In Mortensen and Pissarides (1999a) collective bargaining allows monopoly unions to pick β. Blanchard and Giavazzi (2003) study macroeconomic effects of deregulation in product and labor markets, assuming that labor market regulation determines β. In Brügemann (2004) I extend the present analysis to show that policies boosting the bargaining share β are unable to create their own political support. The reason is the same as for employment protection: they are supported by workers in good matches but shift the distribution of productivity down.

a delay in separation. I calibrate the model and find that the resulting positive feedback from past protection to current political support is sufficiently strong to generate multiple stationary political outcomes: low employment protection is maintained if protection was low in the past, high employment protection survives if past protection was high.

Importantly, involuntary dismissals are not bilaterally efficient: at times a worker is dismissed although he would accept a lower wage at which the firm would be happy to retain him. This raises two questions. Is there evidence for bilaterally inefficient separations? If so, why are bilateral inefficiencies not overcome by the worker and the firm? Answering these questions is not the objective of this paper. As discussed, the objective here is to describe what features of the economic environment enable employment protection to create its own support. Nevertheless, since the answer points to involuntary dismissal, my analysis highlights the need for further empirical and theoretical research into the bilateral (in)efficiency of worker turnover. Directions for this research are outlined in the conclusion.

This paper provides some indirect evidence, however. Notice that with involuntary dismissals an increase in employment protection tends to have the largest benefit for employed workers likely to be unemployed soon. The opposite holds for Nash bargaining. I utilize a recent survey of German workers to study these predictions. Workers were asked about the likelihood of unemployment in the near future as well as their stance towards employment protection reform. The evidence supports the view that an extension of protection is favored more strongly by workers who face a high probability of unemployment in the near future.

Before turning to the model, I briefly highlight the key contributions of this paper vis-à-vis the two closely related studies, postponing a detailed review of these papers and other related work towards the end of the paper. The most direct link is with Saint-Paul (2002). He analyzes the political economy of employment protection in a model of job turnover with vintage capital. Regarding employment protection's ability to create its own support he reaches two conclusions, one qualitative and the other quantitative. Qualitatively he argues that it is the presence of labor market rents (the utility difference between employed and unemployed workers) that makes job duration valuable to workers and thereby enables employment protection to create its own support. Quantitatively, however, he finds that this effect is too weak to sustain multiple stationary political equilibria. I reach the reverse conclusions. Qualitatively, my analysis of Nash bargaining shows that rents *per se* are not key: here workers earn rents but do not value job duration. As mentioned above, this analysis is of independent interest, as it characterizes the structure of political support for employment protection in the standard

Mortensen-Pissarides model with Nash bargaining, where workers benefit from protection through the bargaining effect rather than job duration. Having shown that rents are not key, I trace the value of job duration more narrowly to involuntary dismissals. The distinction between rents and involuntary dismissals is substantively important. Labor market rents are pervasive. In contrast, as mentioned above, the prevalence of involuntary dismissals is less well understood and demands further study. Quantitatively, though, I find that if dismissals are indeed involuntary, then the ability of employment protection to create its own support is sufficiently strong to sustain multiplicity in a calibrated Mortensen-Pissarides model.

Hassler et. al. (2005) analyze the same question but for a different policy: unemployment insurance. In their model workers become more attached to their geographic location the longer they reside there. By reducing geographic mobility unemployment insurance increases attachment. In turn, attached workers vote for more generous unemployment insurance. They find that this self-reinforcing mechanism sustains multiple stationary political equilibria. While they answer affirmatively, as I do for the model with involuntary dismissal, the mechanisms driving these results are different. This is already apparent from differences in the models employed. They study a model in which both wages and separations are exogenous. In essence, how wages are determined and whether separations are involuntary or not is not central to the ability of unemployment insurance to create its own support. In contrast, here workers benefit from firing costs because they affect either wages or dismissals, so endogeneity of both is essential. Furthermore, properties of the separation decision matter for whether employment protection can create its own support. While the mechanism in their paper is different, one may wonder how the tendency of workers to become geographically attached affects the results of the present paper. Could it enable employment protection to create its own support even with voluntary dismissal? In a simple extension I show that the answer is negative in the model with Nash bargaining.

The paper is organized as follows. In section 1 I introduce a version of the Mortensen-Pissarides model. Section 2 presents the two models of wage determination, analyzes their implications for the separation decision, and discusses how they shape the preferences of workers for employment protection. Equilibrium is studied in section 3. In section 4 I describe the political environment. The negative result for Nash bargaining is obtained in section 5. In section 6 I turn to the model with involuntary dismissal. The survey evidence is presented in section 7. Related literature is discussed in section 8. Section 9 concludes.

1 The Model

Time is discrete. There is a continuum of infinitely lived ex ante identical workers of mass one. At a point in time a worker is either unemployed or employed in a match. Each firm-worker match is composed of one worker and one firm.

Timeline. Within a period events unfold as follows. First a fraction of workers in existing matches quits exogenously. Then surviving matches receive a new draw of match specific productivity. Next workers unemployed at the end of last period and vacancies posted during last period are matched and each new match receives an initial draw of match specific productivity. This is followed by separation decisions in all matches. Now production takes place in surviving matches. Finally firms decide whether to post vacancies.

Preferences. All agents have linear utility with discount factor $(1-\rho) \in (0,1)$: the utility of a consumption stream C_t is given by $\sum_{t=0}^{\infty}(1-\rho)^t C_t$.

Creation. Maintaining an open vacancy is associated with a cost c per period. The number of matches this period is given by $m(u,v)$ where u and v are the number of unemployed workers and vacancies at the end of the previous period, respectively. The matching function m has constant returns to scale, is continuous, strictly increasing in both arguments, and satisfies $m(u,v) < \min\{u,v\}$. An open vacancy is matched with probability $q(\theta) \equiv m\left(\frac{1}{\theta},1\right)$. The matching probability of an unemployed worker is $f(\theta) \equiv m(1,\theta)$. The ratio $\theta = \frac{v}{u}$ is referred to as labor market tightness. To insure existence of equilibrium I assume that $\lim_{\theta\to\infty} q(\theta) = 0$.

Production. The initial productivity of a new match is drawn from a distribution given by the distribution function G_{new}. Subsequently a match experiences idiosyncratic productivity shocks. In particular, match specific productivity follows a Markov process with state space $\mathcal{Y} \subseteq \mathbb{R}_+$ and transition function Q. The process is stochastically monotone: if productivity is high today, it is likely to be high tomorrow; formally $y' \geq y$ implies that $Q(y',\cdot)$ first order stochastically dominates $Q(y,\cdot)$.[6] In addition, I make two standard technical assumptions.

[6] Allowing for a general Markov process in discrete time — as opposed to working with specific processes in continuous time — allows me to highlight the *qualitative* features of the productivity process driving the theoretical results.

First, I assume that the state space $\mathcal{Y}$ is bounded. Second, I assume that the transition function satisfies the Feller property.[7] The payoff of non-market activity received by unemployed workers is denoted as $z \geq 0$.

Destruction. There is both exogenous and endogenous destruction. At the beginning of each period an employed worker quits with exogenous probability $\frac{\delta}{1-\rho} \in (0,1)$.[8] Idiosyncratic shocks to match specific productivity are the source of endogenous destruction.

Employment Protection. When dismissing a worker, the firm is bound by statutory employment protection, which is modeled as wasteful firing costs $F \in \mathcal{F} \equiv [0, \bar{F}]$. I focus on wasteful firing costs for simplicity and for comparability with Saint-Paul (2002). All theoretical results of the paper also hold if part of firing costs are paid out as a severance payment to the worker.[9] The upper bound $\bar{F}$ can be infinite. But I also allow for the possibility that legal or physical limits on the resources that can be extracted from firms impose a finite lower bound on the value of firms. This is equivalent to an upper bound on the level of firing costs that can be imposed, so I allow for $\bar{F} < \infty$. I assume that firms in new matches are already subject to employment protection when they learn the initial productivity of a new match. Thus a firm cannot dismiss a worker at no cost if initial productivity is low. When discussing the robustness of results, I address the implications of allowing firms to do so. Quits are not subject to firing costs.

Changes in firing costs are modeled as in Saint-Paul (2002). It is assumed that at time $t = 0$ the economy is in the steady state induced by some past level of firing costs F_0. Now the economy experiences an unanticipated change in the level of firing costs. Within period $t = 0$, I assume that the change occurs after separations have been made, but firms are given another opportunity to dismiss workers right after the change in policy takes effect. No further changes in firing costs are expected to occur in the future. In sections 2-3 the change in firing costs is treated as exogenous. Starting in section 4 the new level of firing costs F is endogenized as the outcome of a political decision.[10]

[7] The Markov process has the Feller property if $\int f(z')Q(z, dz')$ is a bounded and continuous function of z for any bounded and continuous function f. See Stokey and Lucas (1989, p. 220) for a discussion.

[8] I divide by the discount factor to simplify subsequent expressions.

[9] See Brügemann (2004) for details.

[10] I adopt this specification of political dynamics in form of an unanticipated once and for all change to be consistent with previous work. Notice that it is implicitly assumed that firms are surprised by the change in policy and do not have an opportunity to adjust employment before the new level of firing costs becomes

2 Wage Determination and the Separation Decision

In this section I introduce the two models of wage determination contrasted in this paper. I examine how they interact with the separation decision and thereby shape the preferences of workers for employment protection. First I discuss Nash bargaining and then I introduce a model of wage determination that gives rise to involuntary dismissals.

The analysis of wage determination is greatly simplified by the simple transitional dynamics of the Mortensen-Pissarides model in response to changes in parameters such as firing costs.[11] Both labor market tightness and the utility of unemployed workers immediately jump to their new steady state values. Only the level of employment and the distribution of match specific productivity adjust slowly to the new steady state. Therefore I only need to consider the determination of wages in a match that operates in a stationary environment in which firing costs are constant at F and the utility of unemployed workers is constant at U.

Now consider a match in this stationary environment with fluctuating idiosyncratic productivity. Stochastic monotonicity of the productivity process implies that the optimal separation policy is a threshold rule. In general a threshold rule is a tuple $\underline{s} = (\underline{y}, \underline{\lambda})$. The first part $\underline{y}$ is a productivity threshold. The second part $\underline{\lambda}$ is the probability of separation if productivity is exactly equal to the threshold $\underline{y}$.[12]

With knowledge of U, F, current productivity y and the separation rule $\underline{s}$ it is straightforward to compute the joint present discounted value of a match $V(y, \underline{s}, F, U)$. Wage determination is about splitting this value between the worker and the firm, while the separation decision is about the determination of $\underline{s}$, and the two interact in important ways.

2.1 Nash bargaining

With Nash bargaining as it is typically applied to the Mortensen-Pissarides model, the joint value is shared according to the rule

$$\begin{aligned} W_{NB}(y, \underline{s}, F, U) &= U + \beta \left[V(y, \underline{s}, F, U) - (U - F) \right], \\ J_{NB}(y, \underline{s}, F, U) &= -F + (1 - \beta) \left[V(y, \underline{s}, F, U) - (U - F) \right]. \end{aligned} \tag{1}$$

effective. In Brügemann (2006b) I relax this assumption by giving firms an opportunity to dismiss workers before the effective date of the new level of firing costs, and I show that this creates an additional mechanism that can generate multiple stationary political outcomes.

[11] See Pissarides (2000), pp. 59–63.

[12] I need to allow for randomization in the separation rule to establish existence of equilibrium in the model with involuntary dismissals.

Here $W_{NB}(y, \underline{s}, F, U)$ is the utility of the worker and $J_{NB}(y, \underline{s}, F, U)$ is the value of the firm. The worker receives the utility from being unemployed U plus a share $\beta \in (0, 1)$ of the surplus, while the firm receives the remaining share of the surplus on top of the firing costs liability.[13]

The first thing to notice about the sharing rule (1) is that the worker and the firm agree about the choice of the separation rule $\underline{s}$: both want it to maximize the joint value $V(y, \underline{s}, F, U)$. In other words, the separation decision is privately efficient.

The following lemma establishes the comparative statics properties of the threshold productivity. All proofs are collected in the appendix.

Lemma 1. *The threshold productivity $y_{NB}(F, U)$ is strictly decreasing in F and strictly increasing in U.*

Higher firing costs make splitting up less attractive, while less painful unemployment hastens separation. Both the worker and the firm are indifferent with respect to separation when productivity equals $\underline{y}_{NB}(F, U)$, so any separation rule $\underline{s} = (\underline{y}_{NB}(F, U), \underline{\lambda})$ with $\underline{\lambda} \in [0, 1]$ is optimal. Let $\underline{s}_{NB}(F, U)$ be the set of optimal separation rules.

Let $W^*_{NB}(y, F, U) \equiv W_{NB}(y, \underline{s}_{NB}(F, U), F, U)$ be worker utility if the separation decision is optimal. The comparative statics properties of W^*_{NB} are key for the political economy analysis.

Lemma 2. *(a) Consider $U^H > U^L$. The difference $W^*_{NB}(y, F, U^H) - W^*_{NB}(y, F, U^L)$ is positive, bounded above by $U^H - U^L$, and weakly decreasing in y.*

(b) Consider $F^H > F^L$. The difference $W^*_{NB}(y, F^H, U) - W^*_{NB}(y, F^L, U)$ is non-negative, bounded above by $F^H - F^L$, and weakly increasing in y.

To discuss the mechanics of this lemma, it is instructive to examine the wage implied by Nash bargaining:

$$w_{NB}(y, F, U) = \rho U + \beta \left[y - \rho U + (\rho + \delta) F \right]. \tag{2}$$

[13]In Mortensen and Pissarides (1999b) firing costs do not enter the outside opportunity of the firm until the match experiences its first change in productivity. Firing costs improve the bargaining position of the worker and increase wages after the first productivity change. But they do not improve the bargaining position of the worker when the match forms. As a consequence, firing costs reduce the wage before the first productivity change to compensate the firm for the anticipated change in relative bargaining positions. In this environment the analysis of this section still provides the correct preferences of employed workers over firing costs at the time of the political decision, since these workers have already experienced productivity shocks. The equilibrium conditions of section 3.1 need to be adjusted to reflect that firing costs do not improve the bargaining position of workers in new matches, but this does not affect any results.

Higher utility from unemployment benefits employed workers. First, it puts them in a better position upon becoming unemployed. Second, it enables them to obtain a higher wage in bargaining. Higher firing costs enable workers to bargain towards higher wages and increase their utility for constant utility from unemployment. This is the *bargaining effect* of employment protection. Equation (2) reveals a feature of Nash bargaining which makes it a natural benchmark case for studying the bargaining effect: the increase in the wage is uniform across levels of match specific productivity.

Key for the ability of employment protection to generate its own political support is how the effects on worker utility vary with match specific productivity. An increase in the utility of unemployment increases wages only by $\beta\rho(U^H - U^L)$ while the flow value of unemployment increases by $\rho(U^H - U^L)$. Therefore workers in poor matches gain more, simply because they are more likely to become unemployed soon. In contrast, higher firing costs benefit workers in good matches more, holding utility from unemployment constant. They receive the same increase in the wage. But they can expect to remain employed for longer and are thus in a better position to benefit from higher wages.

In equilibrium an increase in firing costs also affects the utility of unemployed workers. To evaluate who gains most one has to take this effect into account. The equilibrium is analyzed starting in section 3. To anticipate the results, it is useful to work with the conjecture that utility from unemployment falls. If this is the case, then the equilibrium effect works in the same direction as the direct effect: workers in good matches suffer least from the drop in utility from unemployment since they are more sheltered from unemployment. In Section 5 this will yield the main result for the model with Nash bargaining: higher firing costs in the past reduce the political support for firing costs today.

I conclude the discussion of Nash bargaining by returning to the distinction made in the introduction between the bargaining effect and the job duration effect as two channels through which workers can benefit from employment protection. There I claimed that the job duration effect is absent in the case of Nash bargaining. Notice however that here employment protection does extend job duration by reducing the separation threshold. If that is the case, why do workers not benefit from this increase in job length? To make this claim precise, notice that firing costs have two effects on worker utility $W_{NB}(y, \underline{s}_{NB}(F,U), F, U)$. The first effect works through wages, the second effect through the separation threshold. Now consider the following thought experiment. Consider an increase in firing costs from F^L to F^H, but fix the wage schedule at $w_{NB}(y, F^L, U)$. One can interpret this as allowing the worker to delay separation through the policy instrument of firing costs while leaving wages unaffected. Would the worker like this instrument to be used? Here the answer is no. This is because given the wage schedule $w_{NB}(y, F^L, U)$, the separation rule $\underline{s}_{NB}(F^L, U)$ is optimal from the perspective of the worker. She does not receive any direct benefit from manipulating the separation threshold. She wants the separation rule to drop after an increase in firing costs, but this is only an afterthought to higher wages through the bargaining effect, as higher wages make staying on the job more attractive.

2.2 Involuntary Dismissal

Now I consider a class of wage determination rules that are orthogonal to Nash bargaining in the following sense. First, an increase in firing costs no longer directly enables workers to obtain a higher wage. Second, the separation rule adopted by the firm is no longer optimal from the perspective of the worker. This gives workers a reason to manipulate this rule through the policy instrument of firing costs. Specifically, I consider wage rules of the form

$$w(y, F, U) = w_{ID}(U). \tag{3}$$

In contrast to the Nash bargaining wage rule (2), here the wage is not conditioned on match specific productivity. In other words, wages are compressed across levels of match specific productivity, and this is what generates involuntary dismissals. The second important difference to Nash bargaining is that the wage is independent of firing costs. This shuts down the bargaining effect, allowing me to focus on the implications of involuntary dismissal.

I assume that the wage rules (3) satisfy the following assumption.

Assumption 1. *The wage function w_{ID} is continuous and satisfies the following properties.*

(a) $w_{ID}(U) > z$ for all $U \geq \frac{z}{\rho}$.

(b) Consider $U^H > U^L \geq \frac{z}{\rho}$. Then

$$0 \leq w_{ID}(U^H) - w_{ID}(U^L) \leq \rho(U^H - U^L).$$

Part (a) of Assumption 1 states that the wage exceeds the value of non-market activity. I show later that this implies that in equilibrium the wage $w_{ID}(U)$ exceeds the opportunity cost of the worker ρU. This is intuitive, as the latter are given by the value of search for a new job which pays the same wage $w_{ID}(U)$, and the flow payoff during search z is below the wage.

What this implies is that any dismissal is involuntary: in contrast to Nash bargaining, here the wage exceeds the opportunity cost at the time of separation. Thus an employed worker can benefit from firing costs even if firing costs do not directly affect the wage. It is convenient to define the involuntary dismissal region $\mathcal{U}_{ID} \equiv \{U | w_{ID}(U) > \rho U\}$, which consists of the values of utility of unemployed workers such that the wage exceeds the opportunity costs. I only need to study the properties of worker utility on this region, since in equilibrium unemployed utility must lie in it.

A simple special case of this wage rule is $w_{ID}(U) = \bar{w}$. In this case a change in firing costs has neither a direct nor an indirect effect on wages. But in general the wage rule (3) allows firing costs to affect wages indirectly by affecting labor market conditions through the utility of unemployed workers U. Part (b) of Assumption 1 states that higher utility from unemployment increases the wage, but less than one for one. This property is shared by the Nash bargaining wage rule (2).

Taking as giving this wage, the firm solves an optimal stopping problem giving rise to a separation threshold $\underline{y}_{ID}(F, U)$.

Lemma 3. *The threshold productivity $y_{ID}(F, U)$ is weakly increasing in U and strictly decreasing in F.*

The qualitative properties of the separation threshold are similar to that of $\underline{y}_{NB}(F, U)$ established in Lemma 1. The only difference is that $\underline{y}_{ID}(F, U)$ is only weakly increasing in U. Unemployed utility affects the separation threshold only through the wage, and if an increase in U does not change the wage, then it leaves the threshold unaffected as well. The firm is indifferent about separation at $\underline{y}_{ID}(F, U)$, so the set of optimal separation rules $\underline{s}_{ID}(F, U)$ is made up of all pairs $(\underline{y}_{ID}(F, U), \underline{\lambda})$ with $\underline{\lambda} \in [0, 1]$.

Now let $W_{ID}(y, \underline{s}, U)$ denote worker utility if current match productivity is y, the wage is $w_{ID}(U)$, and dismissal occurs according to the separation rule $\underline{s}$. Notice that firing costs do not appear as an argument of W_{ID}: conditional on the separation rule, there is no effect of firing costs on worker utility, precisely because the bargaining effect is shut down and firing costs do not affect wages.

Lemma 4. *The function W_{ID} has the following properties.*

(a) Consider U^H, $U^L \in \mathcal{U}_{ID}$ with $U^H > U^L$. Then the difference $W_{ID}(y, \underline{s}, U^H) - W_{ID}(y, \underline{s}, U^L)$ is positive, bounded above by $U^H - U^L$, and weakly decreasing in y.

(b) *Fix* $U \in \mathcal{U}_{ID}$. *Consider* $\underline{s}^L < \underline{s}^H$. *Then the difference* $W_{ID}(y, \underline{s}^L, U) - W_{ID}(y, \underline{s}^H, U)$ *is non-negative.*

According to part (a), there is no difference vis-à-vis Nash bargaining in the comparative statics with respect to utility from unemployment. Part (b) considers a drop in the separation rule. First, a drop in the separation rule needs to be defined. The natural way to order separation rules is lexicographic: if $\underline{s}^L = (\underline{y}^L, \underline{\lambda}^L)$ and $\underline{s}^H = (\underline{y}^H, \underline{\lambda}^H)$, then

$$\underline{s}^L \leq \underline{s}^H \quad \Leftrightarrow \quad \underline{y}^L < \underline{y}^H \text{ or } (\underline{y}^L = \underline{y}^H \text{ and } \underline{\lambda}^L \leq \underline{\lambda}^H).$$

Part (b) states that workers benefit from a drop in the separation rule. This is because it prolongs jobs and any dismissal is involuntary, so that workers want to stay employed as long as possible.

The key question is how the benefit of an increase in firing costs varies with the productivity of the match. In the case of Nash bargaining workers in good matches benefit most from an increase in firing costs. This is different in the model with involuntary dismissal, as now there is a mechanism that tends to make firing costs relatively more beneficial to workers in poor matches. Loosely speaking, workers in good matches are already protected from involuntary dismissal by their high productivity: since productivity is persistent, the evolution of productivity has to be very adverse in order to lead to an involuntary dismissal. Since they are already protected by their high productivity, workers in good matches tend to gain less from employment protection than workers in poor matches.

In section 6.1 I calibrate the model to study this mechanism quantitatively. I present a calibration for two reasons. First, as I describe below, the theoretical results are somewhat weaker than in the case of Nash bargaining. Second, even if the theoretical results were as sharp as for Nash bargaining, one would still like to know how strong the mechanism is likely to be. I find that it is sufficiently strong to sustain multiple stationary political equilibria.

While the quantitative analysis is central, I also develop the theoretical analysis, not least because it provides insights into the mechanism underlying the quantitative results. Recall that part (b) of Lemma 2 makes a strong statement for the case of Nash bargaining: any arbitrary increase in firing costs benefits workers in good matches more than workers in poor matches. At first glance one may seek to establish the analogous but opposite statement under involuntary dismissals, namely that the benefit

$$W_{ID}(y, \underline{s}^L, U) - W_{ID}(y, \underline{s}^H, U) \tag{4}$$

is weakly decreasing in productivity y for any drop in the separation threshold from $\underline{s}^H$ to $\underline{s}^L \leq \underline{s}^H$. It is easy to see, however, why this statement cannot be true in general. Consider two productivity levels, y^L and y^H with $y^L < y^H$. Suppose that $y^L < \underline{y}^L < y^H < \underline{y}^H$ where $\underline{y}^L$ and $\underline{y}^H$ are the separation thresholds associated with $\underline{s}^L$ and $\underline{s}^H$, respectively. Thus y^L is so low that even the low separation rule is not enough to safe this worker's job. Clearly this worker gains nothing if the separation rule is $\underline{s}^L$ rather than $\underline{s}^H$. Given the poor quality of this match, the drop in the separation rule is simply to small to benefit this worker. In contrast, for the worker in the match with productivity y^H the drop in the separation rule makes the difference between dismissal and keeping the job.

The scenario just described implies that it is not generally true that workers in bad matches benefit more from *any* drop in the separation rule. As discussed, this is because some drops are not large enough to help workers in very bad matches. But it is possible to establish a weaker result: all workers benefit if the separation rule drops sufficiently to prohibit all dismissals, and in this case it is true that workers in poor matches benefit most. Formally, let $\underline{s}^P \equiv (0, 0)$ be the separation rule which prohibits dismissals entirely.

Lemma 5. *The difference $W_{ID}(y, \underline{s}^P, U) - W_{ID}(y, \underline{s}, U)$ is weakly decreasing in y on $\mathcal{Y}$ for any $\underline{s}$ and $U \in \mathcal{U}_{ID}$.*

So far I have only examined how one effect of firing costs varies with productivity, namely the effect through the separation threshold. As discussed in Section 2.1, in equilibrium an increase in firing costs also affects the utility of the unemployed. Once again, while this effect will be analyzed formally later, it is possible to anticipate its implications by working with the conjecture that the utility of the unemployed falls. Lemma 4 then implies that workers in poor matches suffer more from this effect of firing costs, because they are more exposed to unemployment. Thus, unlike with Nash bargaining, the two effects work in opposite directions: workers in poor matches tend to gain more from the drop in the separation rule, while suffering more from the fall in the utility of the unemployed. Importantly, prohibitive firing costs once again play a special role here: if dismissals are prohibited, then all workers are equally likely to become unemployed, and thus suffer equally from a drop in the utility of the unemployed. In Section 6 this will lead to the following result: higher past firing costs increase the support for prohibitive firing costs today.

3 Economic Equilibrium and Steady State

3.1 Equilibrium Path

As discussed in section 2, the transitional dynamics of the model are such that the utility of the unemployed U (and thereby the separation threshold $\underline{s}$) as well as labor market tightness θ are constant along the equilibrium path after the change in firing costs at time $t = 0$. I now state the conditions that determine these values in equilibrium. Statements made about the equilibrium path in this section apply to both models of wage determination $M \in \{NB, ID\}$.

An equilibrium is a triple $(U, \theta, \underline{s})$ satisfying the following conditions

$$\underline{s} \in \underline{s}_M(F, U) \tag{5}$$

$$c \geq (1-\rho)q(\theta) \int J_M(y, \underline{s}, F, U) dG_{new}(y) \quad \text{with equality if } \theta > 0, \tag{6}$$

$$\rho U = z + (1-\rho)f(\theta) \int \left[W_M(y, \underline{s}, F, U) - U\right] dG_{new}(y). \tag{7}$$

For notational consistency with the case of Nash bargaining, here I write $W_{ID}(y, \underline{s}, F, U)$ rather than $W_{ID}(y, \underline{s}, U)$, carrying along F as a separate argument although firing costs do not have a direct effect on worker utility.

Condition (5) requires that the separation rule $\underline{s}$ is optimal. Condition (6) is the free entry condition for posting vacancies. The right hand side is the return from posting a vacancy, that is the present discounted value of being matched with a worker next period. In equilibrium it cannot exceed the vacancy cost c and must equal this cost if a positive mass of vacancies is posted. Condition (7) states that the flow value of unemployment ρU is the sum of the value of non-market activity z and the capital gain from being matched with a firm next period.

Lemma 6. *(a) (Existence) For each level of firing costs $F \in \mathcal{F}$ the conditions* (5)–(7) *have a solution.*

(b) (Uniqueness) The equilibrium values of U, θ, and $\underline{y}$, denoted as $U_M^{eq}(F)$, $\theta_M^{eq}(F)$ and $\underline{y}_M^{eq}(F)$, are uniquely determined. Equilibrium utilities $W_M(y, \underline{s}_M^{eq}(F), F, U_M^{eq}(F))$ are uniquely determined.[14]

[14] Thus everything but the separation probability is unique. Under Nash bargaining all separation probabilities $\underline{\lambda}$ are consistent with equilibrium, so $\underline{s}_{NB}^{eq}(F) = \{\underline{y}_{NB}^{eq}(F)\} \times [0, 1]$ is the set of equilibrium separation rules. With involuntary dismissal the separation probability may be unique, this occurs if the productivity level $\underline{y}_M^{eq}(F)$ occurs with positive probability during the life of a match. See the proof for details.

According to part (b) utility levels are well determined, which allows me to express the utility of a worker at time $t = 0$ as a function of the productivity of his match and the future level of firing costs :

$$\mathcal{W}_M(y, F) \equiv W_M(y, \underline{s}_M^{eq}(F), U_M^{eq}(F), F). \tag{8}$$

Unemployed workers are included in this formulation by assigning them the productivity level $u < 0$ and setting $\mathcal{W}_M(u, F) \equiv U_M^{eq}(F)$. Let $\mathcal{Y}_{all} \equiv \{u\} \cup \mathcal{Y}$ be the enlarged productivity space including unemployment.

3.2 Steady State

First I establish that there is a unique steady state distribution of workers over the enlarged state space $\mathcal{Y}_{all}$.[15] Knowledge of the separation rule $\underline{s}$ and labor market tightness θ is sufficient to pin down the steady state distribution.

Lemma 7. *For each pair* $(\underline{s}, \theta)$ *a steady state distribution exists and is unique.*

Let $G_{all}^{ss}(\cdot|\underline{s}, \theta)$ denote the distribution function associated with the steady state distribution as a function of the separation rule $\underline{s}$ and labor market tightness θ. Next I turn to the productivity distribution conditional on employment, denoted as $G_{emp}^{ss}(\cdot|\underline{s})$. It does not depend on labor market tightness θ: the magnitude of flows into and out of unemployment matters for the level of employment but not for the distribution of productivity across employed workers. Now let $\geq_{FSD}$ denote first order stochastic dominance. The following lemma establishes that the productivity distribution shifts down with a fall in the separation rule.[16]

Lemma 8. *Suppose* $\underline{s}^H \geq \underline{s}^L$. *Then* $G_{emp}^{ss}(\cdot|\underline{s}^H) \geq_{FSD} G_{emp}^{ss}(\cdot|\underline{s}^L)$.

Next consider steady state employment, which is given by

$$L^{ss}(\underline{s}, \theta) = 1 - G_{emp}^{ss}(u|\underline{s}, \theta).$$

[15] I compute the steady state distribution at the time of production. This is the productivity distribution and employment level right after the separation decision of the current period. Since in section 4 the political decision takes place right after the separation decision, this provides the correct distribution and employment level to aggregate preferences at the time of the vote.

[16] If the separation rule is so high that no new matches survive their first separation decision, then steady state employment is of course zero and their is no meaningful distribution of productivity across employed workers. In this case it is notationally convenient to set $G_{emp}^{ss}(\cdot|\underline{s})$ equal to the degenerate distribution with all mass at $+\infty$.

An increase in employment protection may simultaneously reduce both the separation rate as well as labor market tightness. Thus the effect on employment is generally ambiguous. This ambiguity is a common feature of equilibrium models of employment protection.[17]

4 The Political Decision

In the previous section the model economy experienced an unanticipated exogenous change in firing costs at time $t = 0$. In the remainder of the paper I assume that the new level of firing costs F is the outcome of a political decision. Now it is the opportunity to change firing costs that arises unanticipatedly.[18] The key question is how the political support for future firing costs F varies with the extent of past employment protection F_0.

Since employed workers are the principal beneficiaries of employment protection, I focus on the question how their support varies with the extent of past protection. I do so by asking: suppose the new level of firing costs is the outcome of a political decision among employed workers, how does the outcome vary with the past level of firing costs? While the focus is on employed workers, I discuss how the results change if the unemployed and firm owners participate in the political decision.

I assume that the political equilibrium is the outcome of probabilistic voting (Lindbeck and Weibull (1997)). A detailed exposition of this model is provided in Persson and Tabellini (2000) and is not repeated here. Voters care not only about the policy at hand — here employment protection — but also about some second dimension which Persson and Tabellini (2000) refer to as "ideology". A key result is that outcomes of the political choice must maximize a weighted sum of individual utilities. In general the model allows for heterogeneity among voters in the strength of the concern for ideology, and a stronger concern for ideology translates into a lower weight. Intuitively, it is easier for candidates to attract the support of "swing-voters" with little ideological attachment, giving these voters a stronger influence on equilibrium policy. Here I assume that the concern for ideology is uniform across workers. Thus the political equilibrium must maximize average utility of employed workers.

As far as the theoretical analysis is concerned, aggregating preferences through average

[17] Ljungqvist (2002) examines the effect of employment protection on the level of employment in a variety of general equilibrium models.

[18] If the opportunity to change regulation is anticipated it would be be inconsistent to assume that the economy is in steady state at time $t = 0$.

utility is an illustrative example. The results I obtain below hold for many alternative ways of aggregating worker's preferences. Below I discuss what qualitative features of the aggregation rule are required for the results to carry over.

Let $\mathcal{F}$ be the set of available political choices. Then the set of political equilibria is[19]

$$\mathcal{P}_{M,emp}(F_0) \equiv \arg\max_{F\in\mathcal{F}} \int \mathcal{W}_M(y,F)dG^{ss}_{emp}(y|\underline{s}^{eq}_M(F_0)). \quad (9)$$

The past level of firing costs F_0 induces a productivity distribution $G^{ss}_{emp}(\cdot|\underline{s}^{eq}_M(F_0))$. The political choice at time $t=0$ must maximize average utility with respect to this distribution. Thus the past level of firing costs affects the political outcome at time $t=0$ through its effect on the steady state productivity distribution prevailing at that time.[20] When the unemployed participated the set of political equilibria is denoted as $\mathcal{P}_{M,all}(F_0)$ and is obtained by replacing the productivity distribution across employed workers with the overall productivity distribution $G^{ss}_{all}(\cdot|\underline{s}^{eq}_M(F_0),\theta^{eq}_M(F_0))$.

To evaluate whether an increase in past firing costs shifts up the set of political choices $\mathcal{P}_{M,emp}(F_0)$ a way of ordering sets is required. I use the *strong set order* $\leq_S$, which is an extension of the usual order from points to sets.[21]

If a positive effect of the past level of firing costs on the current political support for protection is indeed present, then the question arises whether this mechanism is sufficiently strong to generate multiple stationary political outcomes.

Definition 1. *The model M exhibits multiple stationary political equilibria if there exist F^H_0, F^L_0 such that both $F^H_0 \in \mathcal{P}_{M,emp}(F^H_0)$ and $F^L_0 \in \mathcal{P}_{M,emp}(F^L_0)$, and $F^H_0 \notin \mathcal{P}_{M,emp}(F^L_0)$ or $F^L_0 \notin \mathcal{P}_{M,emp}(F^H_0)$.*[22]

[19]If F_0 induces zero steady state employment, then it is notationally convenient to set $\mathcal{P}_{M,emp}(F_0)=\emptyset$.

[20]As a technical aside, recall that the past level of firing costs F_0 may induce a variety of stationary distributions which all share the same separation threshold $\underline{y}^{eq}_M(F_0)$ but differ slightly due to the probability at which workers are dismissed when productivity hits the threshold exactly. The notation used in equation (9) should thus be read as follows: F maximizes average utility subject to some distribution $G^{ss}_{emp}(\cdot|\underline{s})$ with $\underline{s}\in\underline{s}^{eq}_M(F_0)$.

[21] The set $\mathcal{P}^H$ is *as high as* the set $\mathcal{P}^L$, written $\mathcal{P}^H \geq_S \mathcal{P}^L$, if for every $F^L\in\mathcal{P}^L$ and $F^H\in\mathcal{P}^H$, $F^L > F^H$ implies that both F^L and F^H are elements of the intersection $\mathcal{P}^H\cap\mathcal{P}^L$. See Milgrom and Shannon (1994) for a detailed discussion of the strong set order.

[22]Since $\mathcal{P}_{M,emp}(F_0)$ is a set, even if an increase in F_0 shifts down the set $\mathcal{P}_{M,emp}(F_0)$ in the strong set order, there can still be multiple intersections with the 45-degree line. However, if F^H_0 and F^L_0 are two such intersections, then F^H_0 must also be a political equilibrium if F^L_0 prevailed in the past and vice versa. Here I am interested in a more restrictive type of multiplicity, where both low and high firing costs are stationary

Notice that if $\mathcal{P}_{M,emp}(F_0)$ is decreasing in the strong set order, then this rules out multiple stationary political equilibria. In the next section I show that this is the case for Nash bargaining.

5 Nash Bargaining

In this section I show that under Nash bargaining higher firing costs in the past imply lower political support for firing costs today. The argument has two parts. The first part is that an increase in past firing costs shifts down the productivity distribution. The second part is that this is a shift towards workers that have little to gain from firing costs.

Suppose an increase in past firing costs reduces the utility of the unemployed. In this case Lemma 1 implies that the separation threshold $\underline{y}^{eq}_{NB}(F_0)$ drops, and Lemma 8 in turn implies that the productivity distribution falls as well. Thus let

$$\mathcal{F}_{NB} = \left\{F \in \mathcal{F} | \nexists F^H \in \mathcal{F} \text{ s.t. } F^H > F \text{ and } U^{eq}_{NB}(F^H) > U^{eq}_{NB}(F)\right\}$$

be the range over which an increase in firing costs reduces utility from unemployment.

Lemma 9. *Consider $F^H_0, F^L_0 \in \mathcal{F}_{NB}$ with $F^H_0 > F^L_0$. Let $\underline{s}^H_0 \in \underline{s}^{eq}_{NB}(F^H_0)$ and $\underline{s}^L_0 \in \underline{s}^{eq}_{NB}(F^L_0)$. Then $G^{ss}_{emp}(\cdot|\underline{s}^L_0) \geq_{FSD} G^{ss}_{emp}(\cdot|\underline{s}^H_0)$.*

If one could show that under Nash bargaining an increase in firing costs unambiguously reduces utility from unemployment, then the argument would be complete. However, this is not true in general.[23] Instead I take a different approach. I show that if a level of firing costs F is not in the range $\mathcal{F}_{NB}$, then it is dominated in the following sense: there exists a higher level of firing costs which is strictly preferred to F by all workers. Thus F could never have arisen as the outcome of a past political decision. Thus levels of firing costs outside of $\mathcal{F}_{NB}$ are of limited interest. In particular, they cannot be stationary political equilibria.[24]

political equilibria, but it is not the case that low firing costs would also be a political equilibrium in the high firing costs economy or vice versa.

[23]If the bargaining share of workers β is low relative to what would be required in order to satisfy the Hosios (1990) rule for efficiency, then over some range an increase in firing costs substitutes for the low bargaining share of workers and increases the utility of the unemployed. This only applies up to a certain point when the implied bargaining power of workers becomes excessive, giving rise to a hump-shaped function $U^{eq}_{NB}(F)$.

[24]A level of firing costs outside of $\mathcal{F}_{NB}$ may of course be the outcome of a past political decision if model parameters other than firing costs were different in the past.

Lemma 10. *If $F \in P_{NB,emp}(F_0)$ or $F \in P_{NB,all}(F_0)$ for some $F_0 \in \mathcal{F}$, then $F \in \mathcal{F}_{NB}$.*

Now I turn to the second part of the argument. Consider an increase in firing costs in the relevant range $\mathcal{F}_{NB}$. This change reduces utility from unemployment in equilibrium. As discussed in section 2.1, workers in good matches benefit more from the direct effect of higher wages and suffer less from the equilibrium effect of more painful unemployment.

Lemma 11. *Consider $F^H, F^L \in \mathcal{F}_{NB}$ with $F^H > F^L$. Then the difference $\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)$ is weakly increasing in y on $\mathcal{Y}_{all}$.*

With both elements in place, I now obtain the key theoretical result for the model with Nash bargaining: higher firing costs in the past shift down the set of political outcomes today.

Proposition 1. *Consider $F_0^H, F_0^L \in \mathcal{F}_{NB}$ with $F_0^H > F_0^L$. Then $\mathcal{P}_{NB,emp}(F_0^H) \leq_S \mathcal{P}_{NB,emp}(F_0^L)$.*

The support for firing costs is non-increasing on $\mathcal{F}_{NB}$, and levels of firing costs outside of $\mathcal{F}_{NB}$ cannot be a political equilibrium. Together this implies that there is at most one stationary political equilibrium in the set of firing costs $\mathcal{F}$.

Corollary 1. *The model with Nash bargaining does not exhibit multiple stationary political equilibria.*

It is important to point out that these results hold for any $\bar{F} = +\infty$ as well as any $\bar{F} < +\infty$. Recall that I allow for the possibility that legal or physical limits on the resources that can be extracted from a firm imply a lower bound on the value of a firm, which in turn translates into an upper bound on the level of firing costs $\bar{F}$ which can be effectively imposed. This appears more realistic, and it also turns out to be the more interesting case. For $\bar{F} = +\infty$ the results above are of limited interest for the following reason. Over some range employed workers face a trade-off: an increase in firing costs increases wages but makes unemployment more painful. But above some level of firing costs future hiring ceases and utility from unemployment remains constant at $\underline{U} = \frac{z}{\rho}$. Beyond this point there is no longer a trade-off: further increases in firing costs only increase wages, and equation (2) implies that there is no upper bound on the wage level that can be achieved. Thus employed workers would vote for infinite firing costs, no matter what level of firing costs prevailed in the past. This is different if $\bar{F} < +\infty$. Importantly, in this case it does not follow that workers always vote for $\bar{F}$. The level of firing costs at which hiring ceases could be very undesirable. If $\bar{F}$

is below this level or not much larger, then workers would vote for an interior level of firing costs. This interior political equilibrium would be decreasing in the past level of firing costs.

I conclude this section by discussing the robustness of this result with respect to various departures from the baseline specification.

Participation of the Unemployed. Unemployed workers suffer most from an increase in employment protection. Thus if more stringent regulation in the past is associated with higher unemployment today, this provides an additional force reducing support for firing costs today, strengthening the result of Proposition 1.

Corollary 2. *Consider* $F_0^H, F_0^L \in \mathcal{F}_{NB}$ *with* $F_0^H > F_0^L$*. Suppose that* $\underline{s}_0^H \in \underline{s}_{NB}^{eq}(F_0^H)$ *and* $\underline{s}_0^L \in \underline{s}_{NB}^{eq}(F_0^L)$ *implies* $L^{ss}(\underline{s}_0^H, \theta_{NB}^{eq}(F_0^H)) \leq L^{ss}(\underline{s}_0^L, \theta_{NB}^{eq}(F_0^L))$*. Then* $\mathcal{P}_{NB,all}(F_0^H) \leq_S \mathcal{P}_{NB,all}(F_0^L)$*.*

Participation of Firms. Firms in bad matches suffer relatively more from firing costs. They are more likely to pay the firing costs in the near future, so they are more affected by the direct effect of firing costs. The equilibrium effect of lower utility from unemployment moderates wages, which benefits firms in good matches more since they expect to keep the worker for longer. Thus — as for workers — the two effects work in the same direction.

For the economy as a whole, and with bilaterally efficient separations, it is not surprising that high firing costs are less desirable if employment protection was stringent in the past. With low past firing costs the labor market functioned well in the past, workers and firms are well matched on average, the need to move on to better matches is less urgent, so a policy that slows down turnover is less costly. In contrast, if firing costs were high in the past, then firms and workers are poorly matched, and removing policies interfering with the creation of new matches is more desirable. Under Nash bargaining this statement applies not only to the economy as a whole but to *both* firms and workers separately.

Preference Aggregation. The argument of this section is not specific to probabilistic voting. What qualitative properties must the preference aggregation rule satisfy for the argument to apply? As established in Lemma 11 worker preferences satisfy weakly increasing differences. What is needed is that the aggregation rule is monotone in the following sense: if preferences satisfy weakly increasing differences, then a downward shift in the distribution of productivity (in the sense of first order stochastic dominance) must reduce the political outcome. Majority voting is another example with this property.[25]

Hiring Threshold. Now consider departing from the basic model by allowing firms to dismiss workers at no cost after learning initial productivity. Now there is a hiring threshold in addition to the separation threshold. Importantly, this threshold typically increases with the level of firing costs, as match formation becomes more selective given that separation is more costly. How does this affect the results of this section? While an increase in firing costs still tends to shift the productivity distribution down through a lower separation threshold, tougher hiring standards now work in the opposite direction, and the overall effect on the productivity distribution is no longer clear. In Brügemann (2006a) I show that the distribution still shifts down if the increase in firing costs does not reduce the level of employment. Thus if employment effects of employment protection are small relative to their effects on turnover, then higher firing costs in the past still reduce support for employment protection today. But if there is a substantial negative effect on employment, then higher past firing costs may increase the support for firing costs today among *employed* workers. This is balanced by the higher level of unemployment, so whether overall support for firing costs increases depends on the political influence of the unemployed.

Non-uniform Bargaining Effect. As discussed in Section 2.1, under Nash bargaining an increase in employment protection raises wages uniformly across match specific productivity levels. This makes Nash bargaining a natural benchmark for studying the bargaining effect of employment protection. With a uniform effect, longer expected job duration in good matches translates into larger gains from employment protection. To overturn this result, wages of workers in poor matches would have to rise relatively more, sufficient to outweigh shorter job duration. In the limit, a worker just about to be dismissed would require a very large wage increase. Nevertheless, it would be worthwhile to explore the quantitative implications of bargaining models with non-uniform wage effects for the ability of employment protection to create its own support.[26]

[25] The argument in the text implies that the set of Condorcet winners must be decreasing in the past level of firing costs, but it leaves open whether a Condorcet winner exists. A convenient feature of worker preferences in the context of majority voting is that by Lemma 11 they satisfy single crossing, thus a Condorcet winner always exists. See Brügemann (2004) for details.

[26] An alternative way of introducing Nash bargaining into the Mortensen-Pissarides model based on Binmore, Rubinstein, and Wolinsky (1986) would give rise to non-uniform wage effects, see Hall and Milgrom (2005)

6 Involuntary Dismissal

In this section I ask whether employment protection can generate its own political support in the model with involuntary dismissal. First I provide a theoretical analysis and then I turn the calibration.

I start with a preliminary result. In section 2.2 I claimed that in equilibrium the wage $w_{ID}(U)$ always exceeds the opportunity cost of the worker ρU, or equivalently, that the utility of the unemployed U lies in the involuntary dismissal region $\mathcal{U}_{ID}$. This provided the justification for establishing the properties of worker utility W_{ID} in Lemmas 3–5 only on this region. I now verify this claim formally.

Lemma 12. *For all $F \in \mathcal{F}$ equilibrium utility from unemployment satisfies $U_{ID}^{eq}(F) \in \mathcal{U}_{ID}$.*

The intuition is straightforward: the opportunity cost ρU consist of receiving a payoff below the wage z during unemployment, and receiving the same wage as in the current job after finding a new job.

Now I turn to the main analysis, which consists of the same two parts as with Nash bargaining. The first step – showing that an increase in firing costs shifts down the productivity distribution – turns out to be simpler here because an increase in firing costs always reduces the separation rule.

Lemma 13. *Consider $F^H, F^L \in \mathcal{F}$ with $F^H > F^L$. Let $\underline{s}^H \in \underline{s}_{ID}^{eq}(F^H)$ and $\underline{s}^L \in \underline{s}_{ID}^{eq}(F^L)$. Then $\underline{s}^H \leq \underline{s}^L$.*

In conjunction with Lemma 8 this yields a strengthened version of Lemma 9.

Lemma 14. *Consider $F_0^H, F_0^L \in \mathcal{F}$ with $F_0^H > F_0^L$. Let $\underline{s}_0^H \in \underline{s}_{ID}^{eq}(F_0^H)$ and $\underline{s}_0^L \in \underline{s}_{ID}^{eq}(F_0^L)$. Then $G_{emp}^{ss}(\cdot|\underline{s}_0^L) \geq_{FSD} G_{emp}^{ss}(\cdot|\underline{s}_0^H)$.*

Next I turn to the second part. For Nash bargaining Lemma 11 established that workers in good matches benefit more from *any* increase in firing costs. As discussed in Section 2.2, the analogous but opposite statement is not true in the model with involuntary dismissal, because some increases in firing costs are simply not large enough do benefit workers in very poor matches. According to Lemma 6, however, workers in poor matches benefit most if dismissals are prohibited completely. This statement holds for constant utility of unemployed workers. Now I show it still holds if the equilibrium effect of higher firing costs on the utility of

for an application in a different context.

unemployed workers is taken into consideration. As discussed in Section 2.2, in general workers in poor matches suffer more if the utility of the unemployed falls, because they are more likely to become unemployed. Importantly, this difference is leveled if dismissal is prohibited. Thus workers in poor matches benefit more from prohibiting dismissal even if the equilibrium effect is taken into account. To show this formally, first define the prohibitive level of firing costs F^P is as the infimum level that induces an equilibrium separation rule of $s^{eq}_{ID}(F) = \{\underline{s}^P\}$, where $\underline{s}^P = (0, 0)$ is the prohibitive separation rule.

Lemma 15. *Consider $F^L \in \mathcal{F}$. Then the difference $\mathcal{W}(y, F^P) - \mathcal{W}(y, F^L)$ is weakly decreasing in y on $\mathcal{Y}$.*

In conjunction with Lemma 14, this implies that higher past firing costs increase the support for prohibitive firing costs today. Formally, if prohibitive firing costs are a political equilibrium for some level of past firing costs F^L_0, then they continue to be a political equilibrium for any higher level of past firing costs $F^H_0 > F^L_0$.

Proposition 2. *Consider $F^H_0, F^L_0 \in \mathcal{F}$ with $F^H_0 > F^L_0$. If $F^P \in \mathcal{P}_{ID,emp}(F^L_0)$, then $F^P \in \mathcal{P}_{ID,emp}(F^H_0)$.*

This result is echoed by the quantitative results to follow, where prohibitive firing costs emerge as one of two stationary political equilibria.

6.1 Calibration

The calibration has two main parts. First, for a given process for match specific productivity I follow a fairly standard procedure to calibrate the model with zero firing costs to match features of the US labor market. Second, in order to pin down the productivity process I calibrate the model to capture the effect of firing costs on unemployment and worker turnover.

Before describing the two parts of the calibration in detail, I introduce my functional form assumptions. For the benchmark calibration I assume a wage rule of the form $w_{ID}(U) = \bar{w}$. I allow for effects of the utility of the unemployed U on wages when checking robustness. Throughout I assume a standard constant returns to scale Cobb-Douglas matching function $m(u, v) = \phi u^{\alpha} v^{1-\alpha}$.

Now I turn to the first part of the calibration, taking as given the productivity process and considering the model at zero firing costs. I adopt a model period of one week, and set $\rho = 0.001$ for an annual discount rate of 5 percent. Surveying empirical work on the matching function, Petrongolo and Pissarides (2001) identify the interval $[0.5, 0.7]$ as a reasonable range for the parameter α. I choose the midpoint of this interval $\alpha = 0.6$. I set the value of non-market activity z to 0.4 to capture the replacement ratio of unemployment insurance in the US. This choice is inconsequential, however, because under the benchmark wage rule the utility of the unemployed has no effect on the wage, which implies that the equilibrium allocation is unaffected by changes in z. I normalize $c = 1$.[27] The remaining three parameters, ϕ, $\bar{w}$, and δ, are chosen to match features of the US labor market. Specifically, for a given wage $\bar{w}$ and quit rate δ I choose the scale parameter of the matching function ϕ such that the average cost of hiring a worker, given by $\frac{1}{q(\theta)}$, equals four month of wages. This is consistent with the recruiting and hiring costs surveys reported by Hamermesh (1993). Next, given the quit rate δ, I choose the wage $\bar{w}$ such that the weekly matching probability of unemployed workers is $\frac{1}{12}$. Finally, I choose δ such that the weekly separation probability equals $\frac{1}{120}$. One can verify that in each of the three steps one obtains a unique solution. Together the two turnover rates imply an unemployment rate of 9 percent. They are taken from Blanchard and Portugal (2001) and based on CPS data. Their paper is a convenient source for my purposes, because they also carefully construct comparable turnover rates for Portugal, a country with one of the most stringent employment protection regimes. I utilize their findings for Portugal below. This completes the first part of the calibration.

It remains to pin down the process for match specific productivity, which constitutes the second part of the calibration. The process used in Mortensen and Pissarides (1994) is not suitable for my purposes. There, whenever a match experiences a shock, the new level of match specific productivity is drawn from some fixed distribution. As a consequence all employed workers are equally likely to become unemployed irrespective of the current productivity of the match. This has the counterfactual implication that the hazard of dismissal is independent of the duration of the match, while in the data it decreases quite rapidly. While this is innocuous for some purposes, here it is central that the hazard of dismissal varies across workers, because this is precisely what generates heterogeneity in preferences for employment protection. To have a parsimonious process with this feature, I assume that log productivity follows a random walk

$$Q(y, \{e^{\sigma} y\}) = Q(y, \{e^{-\sigma} y\}) = \frac{1}{2}$$

where $\sigma > 0$ parametrizes the volatility of the process. Under this process good matches sur-

[27]It is well known that the two parameters c and ϕ affect the equilibrium allocation only through the ratio $\frac{c^{1-\alpha}}{\phi}$, hence one of the two can be normalized.

vive longer, and thus the dismissal hazard decreases with the duration of the match.[28] There is a second, less important component of the productivity process, namely the productivity distribution of new matches G_{new}. I choose a uniform distribution on $[y_{new}, e^{-\sigma} y_{new})$. Given discrete shocks this is a simple way of generating a steady state productivity distribution with full support, without introducing additional parameters. I normalize y_{new} such that the annuity value of productivity of a match which never separates is equal to one.

The single parameter of this process is σ. I choose this parameter such that the model matches the effect of firing costs on unemployment, and captures the effect of firing costs on worker turnover. Studies surveyed in Addison and Teixeira (2003) report small, statistically insignificant effects with mixed signs of employment protection on unemployment. In light of this evidence, I choose a value of σ such that the unemployment rate at prohibitive firing costs F^P equals the unemployment rate at zero firing costs. It turns out that there are two values of σ satisfying this requirement. The first is immediately evident: if $\sigma = 0$, then there are no shocks to match specific productivity, workers are never dismissed, and firing costs leave the economy unaffected; thus unemployment is the same irrespective of the level of firing costs. This case is of no interest here, because the choice of firing costs is inconsequential. Furthermore, as I argue below, it is also counterfactual since firing costs have no effect on worker turnover. Thus I adopt the second value $\sigma = 0.022$ for which introducing prohibitive firing costs does not affect unemployment. For this value of σ unemployment is $\frac{1}{11}$ at both zero and prohibitive firing costs, but worker turnover rates differ : at prohibitive firing costs both the matching probability of unemployed workers and the separation probability are two thirds of their values at zero firing costs. To assess whether this magnitude of the effect of firing costs on turnover is reasonable, I once again turn to the study of Blanchard and Portugal (2001). They provide a careful comparison of two labor markets, the US and Portugal, which are at opposing ends of the employment protection spectrum. Consistent with the absence of an effect of firing costs on unemployment, they find that both countries have the same unemployment rate. But they find that in Portugal both worker turnover rates are one third of the corresponding values for the US. They argue that differences in employment protection are a plausible explanation for the differences in worker turnover. Adopting this view, the case $\sigma = 0$ discussed above is counterfactual, because it accounts for equality of unemployment but fails to generate differences in turnover. Furthermore, the magnitude of the effect on turnover

[28] The shape of this hazard rate in the calibrated model with zero firing costs is quite close to the hazard rate reported Diebold, D., and D. (1997) by for US data.

Table 1: Calibration

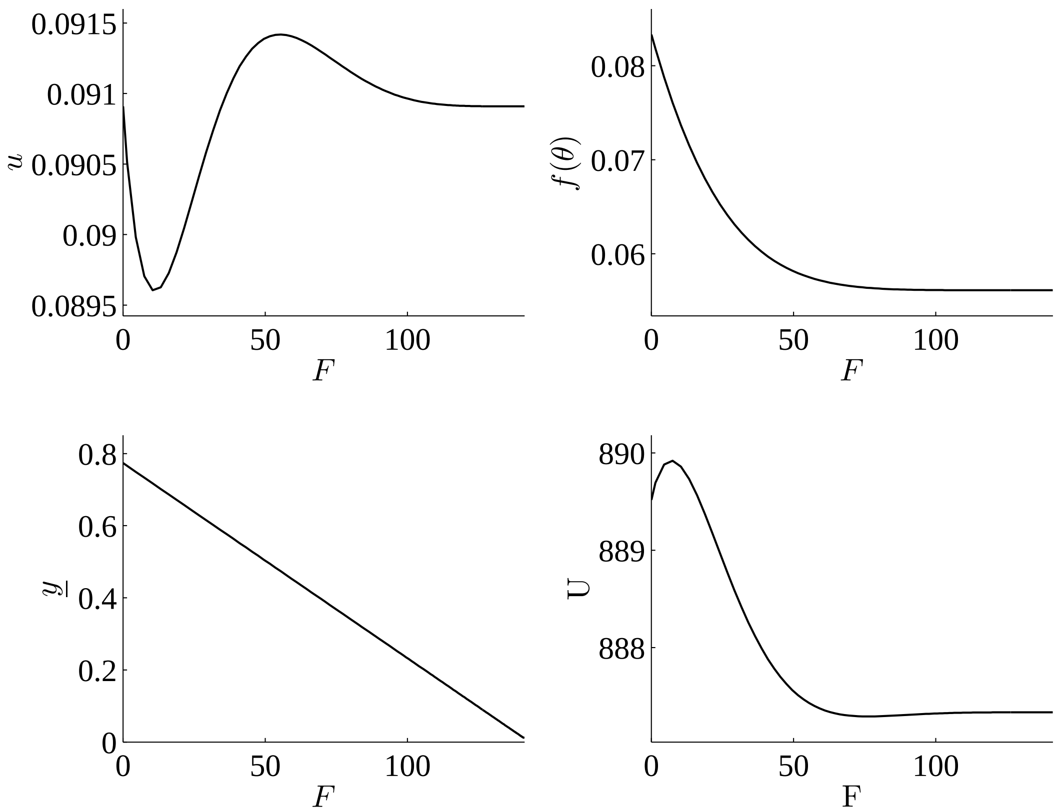
Parameter	Value	Target	Multiplicity
ρ	0.001	na	$\rho \in [0.00065, 0.0019]$
α	0.6	na	$\alpha \in [0.53, 0.64]$
z	0.4	na	$z \in [0, 0.945)$
ϕ	0.076	$\frac{1}{q^0} = 16\bar{w}$	$\frac{1}{q^0} = 16\bar{w} \in [7.51, 35]$
$\bar{w}$	0.945	$f^0 = \frac{1}{12}$	$f^0 \in [0.48, 3.24] \cdot \frac{1}{12}$
δ	0.0056	$d^0 = \frac{1}{120}$	$d^0 \in [0.42, 2.5] \cdot \frac{1}{120}$
σ	0.022	$u^P = \frac{1}{11}$	$u^p \in [0.99, 1.01] \cdot \frac{1}{11}$
γ	0	na	$\gamma \in [0, 0.2]$

obtained for $\sigma = 0.022$ appears very reasonable. It falls short of accounting for the entire difference of turnover between the US and Portugal, but notice that here the level of firing costs is the only parameter that is allowed to vary across economies.[29]

The calibration is summarized in Table 1. The second column gives the parameter values, and the third column provides the calibration targets if applicable. Here q^0, f^0 and d^0 are the matching probability of firms, the matching probability of workers, and the separation probability, all for zero firing costs, while u^P is the unemployment rate under prohibitive firing costs. Figure 4 shows how the equilibrium varies with the level of firing costs. By construction, steady state unemployment equals $\frac{1}{11}$ both at zero firing costs and at the prohibitive level, which equals $F^P = 141.2$. Also by construction, the matching probability of workers equals $\frac{1}{12}$ at zero firing costs. As already discussed, introducing prohibitive firing costs reduces this probability by one third. The separation threshold is monotone decreasing in the level of firing costs, as it must be according to Lemma 13. Introducing a small amount of firing costs benefits unemployed workers: the lower job finding rate is outweighed by longer job duration if one does find a job. Further increases in firing costs sharply reduces unemployed utility, which rebounds a little bit approaching prohibitive firing costs.

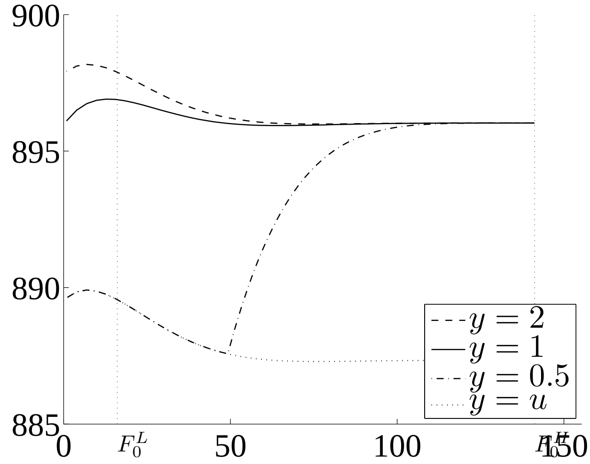
[29] Another way of assessing whether $\sigma = 0.022$ is reasonable is to compare it to measures of the magnitude of idiosyncratic shocks. There is no direct evidence on the magnitude of match specific productivity shocks. Estimates at the firm level are available. Comin and Philippon (2005) report estimates of the standard deviation of the annual growth rate of sales (of the median firm) between 0.1 and 0.21 for the US. Here $\sigma = 0.022$ implies a standard deviation of annual growth of match specific productivity of 0.15.

Figure 1: Equilibrium as a function of F

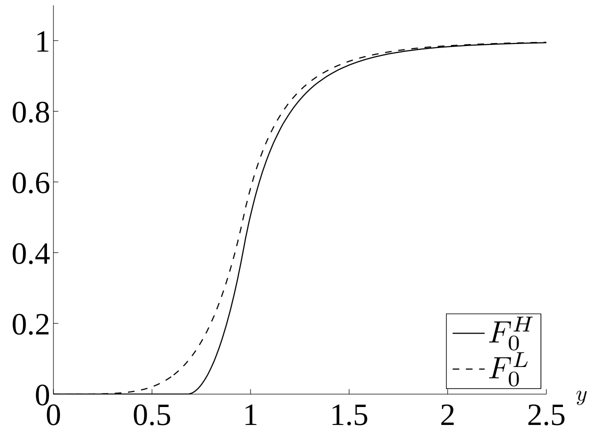


Next I turn to the question which levels of firing costs constitute stationary political equilibria. As a first step, panel (a) of Figure 2 illustrates how worker preferences for employment protection vary with match specific productivity. For comparison the dotted line shows the utility of unemployed workers. The dashed line displays the utility of a worker in a very good match with productivity 2. This worker faces a spell of unemployment if she quits, so she benefits from the increase in utility from unemployment associated with introducing a little bit of employment protection. But she need not be very concerned about being dismissed, so she benefits very little from the fact that employment protection also delays dismissal. This is different for a worker with productivity 1, whose utility is represented by the solid line. This worker benefits from increasing firing costs beyond the point where employment protection is beneficial to unemployed workers, because he is relatively likely to face dismissal. Finally consider the utility of a worker with productivity $\frac{1}{2}$, represented by the dash-dotted line. For low levels of firing costs this worker is dismissed. Over this range her utility coincides with that of an unemployed worker. As firing costs increase at some point her job is saved and she

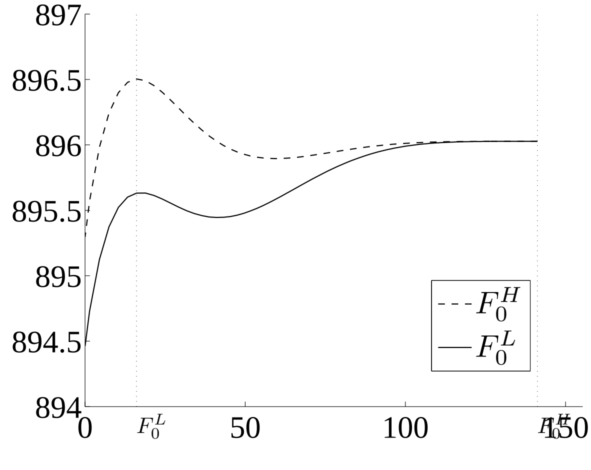
Figure 2: High vs. Low Past Firing Costs



(a) Preferences $\mathcal{W}_{ID}(y, F)$ as function of F



(b) Cumulative Distribution



(c) Average Employed Utility

continues to benefit from increasing firing costs as her job security is improved.[30]

If firing costs were high in the past, then many workers are in a similar situation to the worker with productivity $\frac{1}{2}$, generating strong support for prohibitive firing costs. If firing costs were low in the past, then the worker with productivity one is more representative, and there is strong support for small but positive firing costs. It turns out that these forces give rise to two stationary political equilibria $F_0^H \equiv F^P$ and F_0^L.

According to Lemma 14 an increase in firing costs shifts down the distribution of match specific productivity. Panel (b) illustrates the magnitude of this shift for an increase in firing costs from F_0^L to F_0^H. With low past firing costs there are no matches with productivity below $\underline{y}(F_0^L) = 0.69$. With prohibitive firing costs 10 percent of employed workers are below this threshold, and overall the distribution is shifted towards lower quality matches.

Panel (c) shows how this shift in the productivity distribution translates into differences in average utility of the employed. High firing costs in the past clearly reduce average utility, so the dashed line is everywhere below the solid line.[31] The graph confirms that both F_0^H and F_0^L are stationary political equilibria. Since F_0^H is not a maximizer if F_0^L prevailed in the past and vice versa, it follows that the definition of multiplicity introduced in Section 4 is satisfied.

Again I conclude the section with a discussion of robustness.

Parameters and Calibration Targets. The final column of Table 1 examines how robust multiplicity of stationary political equilibria is to changes in parameters and calibration targets. Each entry shows the range of values for each respective parameter or target for which multiplicity arises. In each case other parameters and targets are fixed at their values in the benchmark calibration, and the model is recalibrated accordingly. Multiplicity is not sensitive to the choice of the discount rate. Regarding the matching function elasticity α, multiplicity obtains over most of the interval $[0.5, 0.7]$ identified as reasonable by Petrongolo and Pissarides. As discussed before, the value of non-market activity z does not affect the equilibrium allocation, and it does not change the conclusion with respect to multiplicity, as long as it is below the wage $\bar{w}$ of the benchmark calibration. The multiplicity range for the hiring cost target $\frac{1}{q^0}$ is 2 to 9 month. The corresponding range for the matching probability

[30] At the prohibitive level F^P all employed workers have the same level of utility. This is because they all receive the same wage and are completely protected from dismissal.

[31] They only coincide if firing costs are prohibitive for the reason discussed in footnote 30: all workers are completely safe from dismissal and receive the same wage.

target f^0 encompasses all plausible values, and the same applies to the separation probability target d^0. The result of multiplicity is most sensitive to the effect of firing costs on unemployment, because the magnitude of this effect matters greatly for the *level* of support for firing costs. If prohibitive firing costs reduce the unemployment rate by more than one percent, then prohibitive firing costs are the political equilibrium irrespective of the past level of firing costs. A low value of firing costs is the unique political equilibrium if the unemployment rate increases by more than one percent. Finally, I depart from the benchmark wage rule, allowing labor market conditions to affect the wage through the utility of the unemployed. Specifically, I consider a wage rule $w_{ID}(U) = \bar{w} + \gamma\rho U$. Note that $\gamma = 1$ is the largest value consistent with Assumption 1, and would imply that the wage increases one for one with the opportunity cost of the worker. The last row of Table 1 shows that multiplicity obtains for γ below 0.2; for larger values the stationary equilibrium with prohibitive firing costs disappears.

Participation of the Unemployed. Is multiplicity specific to the case in which only employed workers participate? One can check the following in the calibration: if unemployed workers participate in the vote, then this reduces the *level* of support for employment protection somewhat; but both F_0^H and F_0^L continue to be stationary political equilibria.

Participation of Firm Owners. For the same reasons as under Nash bargaining firms in poor matches suffer more from stringent employment protection. Thus giving political influence to firms weakens the ability of employment protection to generate its own political support. Under Nash bargaining high firing costs in the past create a shared desire by both firms and workers to deregulate. In contrast, with involuntary dismissal high past firing costs make workers and firms more divided about the level of firing costs to be set today.

Hiring Margin. The negative conclusion under Nash bargaining is quite robust to allowing firms to dismiss new workers at no cost after learning initial match specific productivity. This is different here. Now the following scenario is possible: an increase in past firing costs mostly increases hiring standards, thereby generating both more good matches and more unemployment. Both groups dislike employment protection. Therefore the following empirical question is of some importance for understanding the political economy of employment protection: is the drop in hiring associated with higher firing costs mostly due to reduced recruiting effort (here captured by vacancy creation), or is it mostly driven by more selective hiring?

7 Evidence from a Survey of Employees

In the summer of 2004 researchers at the Universities of Jena and Hannover conducted a representative phone survey of 3039 persons between the ages of 20 and 60. In order to enable an East-West comparison, about 1500 persons in each Eastern and Western Germany were surveyed. The primary focus of the survey was the perceived fairness of layoffs and pay cuts.[32] In the process two question were asked that are of particular interest in the present context. First, employed respondents were asked "How likely is it in your opinion that you will become unemployed in the near future? Very likely, somewhat likely, somewhat unlikely, or very unlikely?" Second, all respondents were asked "Should statutory employment protection be extended, maintained without change, somewhat reduced, or entirely abolished?"

The prediction of the model with Nash bargaining is clear: workers in good matches are unlikely to be dismissed and are the most ardent supporters of employment protection.

As discussed in Section 2.2, the analogous but opposite statement is not generally true in the model with involuntary dismissal. In the calibration, however, workers in poor matches tend to demand higher levels of employment protection, which is the force behind multiple stationary political equilibria. Formally, Lemma 15 yields the prediction that increasing firing costs from the status quo F_0 to the prohibitive level F^P benefits workers in bad matches relatively more.

Prediction 1. *Consider* $F_0 \in \mathcal{F}$. *Then* $\mathcal{W}_{ID}\left(F^P, y\right) - \mathcal{W}_{ID}\left(F_0, y\right)$ *is weakly decreasing.*

A second prediction applies to a deregulation, that is a reduction from the status quo F_0 to a lower level of firing costs $F < F_0$. Compare two workers with productivity levels $y_H > y_L$ who are both left unemployed by this deregulation. Then the worker in the better match suffers more because he loses a better job.

Prediction 2. *Consider* $F,\ F_0 \in \mathcal{F}$ *with* $F < F_0$. *Then* $\mathcal{W}_{ID}(F, y) - \mathcal{W}_{ID}(F_0, y)$ *is weakly decreasing for* $y < \underline{y}_{ID}^{eq}(F)$.

According to these predictions workers in matches close to $\underline{y}_{ID}^{eq}(F_0)$ are in the following situation: under the status quo they are very likely to become unemployed, so they benefit

[32] The project received support from the Hans-Böckler Foundation, which maintains the following web page concerning the project: `http://www.boeckler.de/cps/rde/xchg/SID-3D0AB75D-304D8C79/hbs/hs.xsl/show_project_fofoe.html?projectfile=S-2003-546-3.xml`. See Gerlach et al. (2006) for an analysis of the perceived fairness of layoffs and pay cuts using this survey.

Table 1: Cross Tabulation

Unemployed in near future?	Employment Protection				
	extend	unchanged	reduce	abolish	total
very likely	41	60	17	19	137
	29.93	43.80	12.41	13.87	100.00
somewhat likely	90	174	51	16	331
	27.19	52.57	15.41	4.83	100.00
somewhat unlikely	153	367	173	36	729
	20.99	50.34	23.73	4.94	100.00
very unlikely	49	174	65	24	312
	15.71	55.77	20.83	7.69	100.00
unemployed	138	178	53	39	408
	33.82	43.63	12.99	9.56	100.00
total	471	953	359	134	1917
	24.57	49.71	18.73	6.99	100.00

most from prohibiting employment protection; on the other hand, they have relatively little to loose if employment protection is abolished.

Now I examine how these predictions fare when confronted with the survey data. I drop the self-employed, persons out of the labor force as well as non-respondents to the questions of interest. This leaves 1917 respondents that are either employees or unemployed. Table 1 provides a simple cross tabulation of the answers to the two questions of interest.

The first column shows that the percentage of workers in favor of extending employment protection is monotone increasing in the perceived likelihood of future unemployment. This pattern is inconsistent with Nash bargaining. It is consistent with the model of involuntary dismissal, and confirms Prediction 1 to the extent that the contemplated extension of employment protection would be prohibitive. The pattern in the fourth column is consistent with prediction 2: 13.87 percent of workers considering it very likely to be unemployed in the near future want to see employment protection abolished, while the corresponding percentage varies between only 4.83 percent and 7.69 for employees who consider their job safer. Notice that the responses of unemployed workers are somewhat puzzling from the perspective of both models, and models of the political economy of employment protection more generally. Still

Table 2: Probit Regression

dependent	extend		abolish	
very likely	0.136	(2.75)	0.041	(1.59)
somewhat likely	0.114	(2.99)	-0.029	(-1.67)
somewhat unlikely	0.054	(1.69)	-0.028	(-1.76)
very unlikely	excluded			
unemployed	0.123	(2.87)	-0.002	(-0.07)
male	-0.077	(-3.62)	0.026	(2.11)
west	-0.052	(-2.46)	-0.019	(-1.61)
white collar	-0.048	(-1.66)	-0.11	(-0.67)
age	-0.003	(-3.07)	0.0004	(0.75)
vocational school	-0.58	(-1.45)	-0.018	(-0.73)
foreman certificate	-0.098	(-1.96)	0.042	(1.41)
professional school	-0.045	(-1.40)	-0.001	(-0.06)
college or university	-0.104	(-3.95)	-0.01	(-0.63)
other degree	0.032	(0.36)	-0.018	(-0.36)
no degree	0.043	(0.94)	0.033	(1.21)
apprenticeship	excluded			
observations	1917		1917	

NOTE.– z-statistics of underlying coefficients in parentheses.

in line with theory, unemployed workers dislike the status quo and are more often in favor of abolishing employment protection than the average employed worker. But they most often respond in favor of extending employment protection.

The survey provides a limited number of controls, including age, sex, part of Germany (East or West), whether the worker is blue or white collar, and information on the highest degree obtained. I run probit regressions, again focussing on the responses "extend" and "abolish". Table 2 reports the discrete change in probability associated with each independent dummy variable and the marginal effect of age. The results show that the pattern in the tabulation is robust with respect to these controls.

8 Related Literature

First I review the two closely related studies which I already discussed briefly in the introduction, then I turn to other related work.

8.1 Saint-Paul (2002)

Saint-Paul (2002) employs a model of job turnover with vintage capital. As described in the introduction, his conclusions regarding employment protection's ability to create its own support differ from mine both qualitatively and quantitatively. I will now discuss the origins of these differences.

Qualitatively Saint-Paul points to labor market rents (defined as the utility difference between employed and unemployed workers) as the reason why workers value job duration and thus as the source of employment protection's ability to create its own political support. He does not discuss bilateral inefficiency or involuntary dismissal. My argument why rents *per se* are not the driving force rests on my analysis of Nash bargaining: here workers receive rents but do not gain from job duration. I trace the value of job duration to involuntary dismissals. The distinction between rents and involuntary dismissal is substantively important: while labor market rents are pervasive, the prevalence of involuntary dismissals is much less well understood and calls for further study.

I now explain the origin of the different qualitative conclusions. The key differences in the analyses lie in wage determination and how it interacts with firing costs. These differences can be discussed within the Mortensen-Pissarides model, so there is no need to explain the vintage capital structure of Saint-Paul's model.

Saint-Paul assumes that wages are determined by bargaining, specifically the special case in which workers have all the bargaining power. Thus at first sight his results appear to be at odds with my findings for Nash bargaining. I will show that in fact dismissal is involuntary in Saint-Paul's model, so the results are consistent. As a first step, I have to discuss how Saint-Paul introduces firing costs, which is different from my approach. He assumes that firing costs are attached to jobs rather than workers. Thus a firm can costlessly fire an incumbent and hire a replacement worker for a given job, but it has to pay the firing costs if the job is eliminated. In order to give incumbent workers some rents, it is assumed that replacement workers are less productive. As before, let y denote the state of a job. But now y only corresponds to the productivity of the job if it is still occupied by the original incumbent. If occupied by a replacement worker, a job in state y produces only $(1-\varphi)y$ with $\varphi \in (0,1)$. Let $\underline{y}_I(F,U)$ and $\underline{y}_R(F,U)$ denote the bilaterally efficient separation thresholds if the job is occupied by the original incumbent and a replacement worker, respectively. The thresholds satisfy $\underline{y}_I(F,U) < \underline{y}_R(F,U)$: given the state y incumbents are more productive, so for some states separation is bilaterally efficient for replacement workers but not for incumbents. A firm employing an incumbent has two outside options: replacing the worker or destroying the job. For $y \geq \underline{y}_R(F,U)$ the former is optimal, for $y < \underline{y}_R(F,U)$ the latter is preferable. The original incumbent has all the bargaining power, and thus obtains the entire surplus of the relationship. This is accomplished by the wage rule

$$w_I(y,F,U) = \begin{cases} \rho U + \varphi y & y \geq \underline{y}_R(F,U) \\ \rho U + [y - \rho U + (\rho+\delta)F] & y < \underline{y}_R(F,U) \end{cases} \tag{10}$$

For $y \geq \underline{y}_R(F,U)$ the incumbent receives precisely the productivity differential he enjoys over replacement workers. For $y < \underline{y}_R(F,U)$ the replacement option is irrelevant and the wage is given by equation (2) with $\beta = 1$. Exactly as with Nash bargaining, dismissals are voluntary under this wage rule. Saint-Paul obtains a different wage schedule by assuming that incumbent workers always increase the wage up to the point at which the firm is indifferent between keeping and replacing them:

$$w_{SP}(y,F,U) = \rho U + \varphi y \tag{11}$$

for all $y \in \mathcal{Y}$. Implicitly, workers ignore that for $y < \underline{y}_R(F,U)$ firms have have access to — and utilize — the superior outside option of job destruction. As a consequence dismissal is involuntary.

Discerning the reasons for the different quantitative conclusions is more difficult, as here the vintage capital structure of Saint-Paul's model does matter. What can be said is that he imposes two restriction in his model, which, if imposed in my calibration, would have led to the conclusion that multiplicity does not arise. First, he assumes free entry into creating jobs, which is equivalent to assuming a matching function elasticity $\alpha = 0$. Second, in equation (11) the wage increases one for one with the opportunity cost of the worker, which corresponds to the case $\gamma = 1$ in the robustness analysis.

8.2 Hassler et. al. (2005)

Hassler et. al. (2005) study whether unemployment insurance can create its own political support. They consider an environment in which workers tend to become more attached to their geographic location the longer they reside there. Unemployment insurance reduces geographic mobility and thereby increases geographic attachment. Furthermore, more attached workers support more generous unemployment insurance. They find that this self-reinforcing mechanism is strong enough to sustain multiple stationary political equilibria.

Thus they answer affirmatively, as I do for the model with involuntary dismissal. As discussed in the introduction, the mechanisms underlying these results are different, however. They are able to develop their argument in a model in which both wages and dismissals are exogenous. Workers value unemployment insurance because they are risk averse and markets are incomplete. Geographically attached workers benefit more because for them the option to change location in order to find a job quickly is less attractive. For this mechanism it is not important whether workers are dismissed voluntary or not, and wage effects of unemployment insurance play no role. In contrast, here workers benefit from employment protection either through an effect on wages or a delay in dismissal, so endogeneity of both is essential. Furthermore, only for the model with involuntary dismissal do I find that employment protection creates its own support. Thus properties of the separation decision matter, whereas they do not in the case of unemployment insurance.

The mechanisms do share a common feature, however. In Hassler et. al. (2005) past policy affects the political choice today through the distribution of geographical attachment, here the effect works through the distribution of match specific productivity. I now briefly discuss whether there is an important difference between geographic attachment and match specific productivity. Specifically, I ask whether the tendency of workers to become attached enables employment protection to create its own support even if dismissal is voluntary. Consider the following modification of the model with Nash bargaining. Whenever a worker becomes unemployed he has to move to a different geographic location to search for a new job. This is associated with a mobility cost a, which captures the attachment of the worker to his current location and is incurred upon dismissal. In a new job, and thus a new location, the worker start with initial attachment a_0. Subsequently attachment is subject to idiosyncratic shocks. Specifically, attachment follows a stochastically monotone Markov process. This process may exhibit a positive trend, capturing the idea that workers tend to become more attached to a location the longer they reside there. The trend will not matter for the results that follow, however. To focus on the role of geographic attachment I abstract from match specific productivity shocks, assuming that output of all matches is constant at y_0. Thus all endogenous turnover is driven by geographic attachment. Adapting the wage formula (2) yields

$$w_{GA}(a, F, U) = \rho(U - a) + \beta[y_0 - \rho U + a + (\rho + \delta)F].$$

The wage is decreasing in attachment a because more attached workers are in a weaker bargaining position. Adapting Lemma 1, the model implies a separation threshold $\underline{a}_{GA}(F, U)$ which is strictly decreasing in F and strictly increasing in U. The interpretation of the negative effect of firing costs on the separation threshold from the worker's perspective is as follows: an increase in firing costs boosts wages, inducing workers to stay in jobs even if there attachment to the geographic location is low. Thus an increase in firing costs shifts down the attachment distribution. Although firing costs prolong the duration of jobs, even with a positive trend in attachment this does not translate into higher average attachment in the economy. This is due to selection: firing costs precisely induce workers with little attachment to stay in their jobs. Adapting Lemma 2, the utility gain from an increase in firing costs $W^*_{GA}(a, F^H, U) - W^*_{GA}(a, F^L, U)$ is increasing in a. In other words, workers with little attachment gain less from an increase in firing costs because they are likely to leave their job soon anyway. Taken these results together, one obtains the analogue to Proposition 1: an increase in firing costs shifts down the distribution of attachment and thus reduces the support for employment protection. In particular, there is at most one stationary political equilibrium.

8.3 Other Related Literature

Other related work can be grouped into two categories. Research in the first group addresses other aspects of the political economy of employment protection. Papers in the second group examine the ability of policies other than employment protection to create their own political support.

Vindigni (2002) builds on Saint-Paul's work and examines how the extent of idiosyncratic uncertainty affects the political support for employment protection. He builds on Saint-Paul's work and examines how the extent of idiosyncratic uncertainty affects the level of political support for employment protection. He finds that an increase in idiosyncratic risk increases the support for firing costs if rents going to workers are large while the opposite effect occurs if the bargaining power of workers is low.

Several papers trace differences in employment protection across countries to differences in fundamentals such as civic attitudes (Algan and Cahuc (2006)), religion (Algan and Cahuc

(2004)), credit market imperfections (Fogli (2004)) and costs of interregional mobility (Belot (2004)). Their examination of the role of fundamentals complements the focus of the present paper on endogenous persistence.

Boeri and Burda (2003) take the extent of employment protection as given and argue that higher firing costs increase the political support for wage rigidity. Thus their work is complementary to the present paper, which takes features of wage determination as given and examines how they shape the political support for employment protection.

Several papers on the political economy of employment protection examine interactions with other policies. Boeri, Conde-Ruiz, and Galasso (2003) provide a political economy analysis of the trade-off between employment protection and unemployment benefits. Koeniger and Vindigni (2003) develop a model in which more regulated product markets are associated with stronger support for employment protection.

Benabou (2000) is part of the second group. He develops a theory in which low inequality is conducive to the adoption of redistributive policies, which in turn perpetuate low inequality. In Hassler et al. (2003) redistributive policies affect private investments in such a way as to maintain the constituency for redistribution. Finally, Coate and Morris (1999) analyze the phenomenon of policy persistence more generally, and argue that it arises if agents respond to the introduction of a policy by undertaking investments to benefit from this policy.

9 Concluding Remarks

In this paper I examined under which circumstances employment protection has the ability to create its own political support. I have shown that the answer depends crucially on the interplay between wage determination and the separation decision.

Under the standard assumption of Nash bargaining workers gain from employment protection through an improved bargaining position. In this environment more stringent protection in the past actually reduces support for employment protection today.

I found that employment protection can create its own support if workers benefit instead through the delay of involuntary dismissals. In the calibrated model this mechanism turned out to be sufficiently strong to sustain multiple stationary political equilibria.

To conclude, I outline two directions for future research. First, it would be desirable to better understand features of separation decisions and employment protection, particularly those that have emerged as important in the analysis of the present paper, but have received little attention in previous work. First, only a small empirical literature has attempted to attack the question to what extent separations are involuntary.[33] Second, the relative importance of channels through which workers benefit from employment protection are not well understood. Do they support employment protection because it enhances their bargaining position, because it delays involuntary dismissals, or because they benefit through some other channel such as insurance?[34] Finally, while it is well understood that employment protection reduces the job finding rate, it is not clear whether this comes about mostly through less recruiting effort or more selective hiring by firms.

A second direction for future work would be to jointly analyze the political determination of employment protection and the framework for wage determination. In the present paper I took the features of wage determination as given and analyzed their implications for the political economy of employment protection. However, features of wage determination are themselves influenced by labor market policy. Minimum wages and the wage compression associated with collective bargaining and strong unions limit the ability of firm-worker pairs to set match specific wages and thus may be important sources of involuntary dismissals. Since both wage determination and employment protection are influenced by labor market policy and interact in important ways, it would be desirable to extend the model to study their joint determination.[35] An interesting question is then whether particular bundles of wage policies and employment protection have the ability to create their own political support.

[33] In an early paper McLaughlin (1991) found separations observed in the Panel Study of Income Dynamics to be consistent with bilaterally efficient turnover. In a recent paper using Dutch matched worker-firm data, Gielen and van Ours (2006) find that inefficient quits are rare while inefficient layoffs occur frequently.

[34] The insurance role of employment protection is analyzed by Pissarides (2001) and Bertola (2004) in an environment with risk averse workers and imperfect insurance markets.

[35] Bertola and Rogerson (1997) discuss complementarities of wage determination and employment protection.

A Proofs of Lemmas 1 and 2

In equilibrium utility from unemployment cannot be lower than the utility from perpetual unemployment $\underline{\mathrm{U}} \equiv \frac{z}{\rho}$. Boundedness of the state space $\mathcal{Y}$ implies that utility from unemployment cannot exceed some upper bound $\bar{U}$ for any value of firing costs F or any of the two models of wage determination. Thus it is sufficient to analyze wage determination and the separation decision for utility from unemployment varying in the set $\mathcal{U} \equiv [\underline{\mathrm{U}}, \bar{U}]$. Firing costs are allowed to vary in $\mathcal{F} = \mathbb{R}_+$. The optimal stopping problem for the maximization of the value of the match is

$$V^*(y, F, U) = \max \left\{ y + \delta U + (1 - \rho - \delta) \int V^*(y', F, U) Q(y, dy'), U - F \right\}.$$

The second argument of the maximum operator is the joint payoff if the match dissolves today, given by the utility of unemployment obtained by the worker minus the firing costs liability of the firm. The first argument of the maximum operator is the value of continuing the match. This yields output y this period. With probability $\frac{\delta}{1-\rho}$ the worker quits at the beginning of next period. In this case the firm obtains zero (it does not have to pay the firing costs) while the worker obtains utility $(1 - \rho)U$, as he is unemployed at the beginning of next period. Taken together this yields the present discounted joint payoff δU. If the worker does not quit, then the match survives into the next period, receives a new productivity draw y', and once again faces the same decision.

Lemma A. *The joint value function V^* is bounded, continuous, and has the following properties.*

(a) For each $(F, U) \in \mathcal{F} \times \mathcal{U}$ there exists a unique threshold $\underline{y}_{NB}(F, U) \in \mathbb{R}$ such that $V^*(y, F, U)$ equals $U - F$ for $y \leq \underline{y}_{NB}(F, U)$ and is strictly increasing in y for $y \geq \underline{y}_{NB}(F, U)$.

(b) Fix $U \in \mathcal{U}$. Consider $F^H, F^L \in \mathcal{F}$ with $F^H > F^L$. Then $\underline{y}_{NB}(F^H, U) < \underline{y}_{NB}(F^L, U)$. The difference $V^*(y, F^H, U) - V^*(y, F^L, U)$ is non-positive, bounded below by $F^L - F^H$, and weakly increasing in y.

(c) Fix $F \in \mathcal{F}$. Consider $U^H, U^L \in \mathcal{U}$ with $U^H > U^L$. Then $\underline{y}_{NB}(F, U^H) > \underline{y}_{NB}(F, U^L)$. The difference $V^*(y, F, U^H) - V^*(y, F, U^L)$ is non-negative, bounded above by $U^H - U^L$, and weakly decreasing in y.

Proof. Let $\mathcal{V}'$ be the set of functions $V : \mathcal{Y} \times \mathcal{F} \times \mathcal{U} \to \mathbb{R}$ satisfying all the properties stated in the lemma. Let $\mathcal{V}$ be the set of functions obtained when the strictly increasing requirement in property (a) is replaced by weakly increasing, and the strict inequalities in properties (b) and (c) are replaced by weak inequalities. Define the operator

$$(TV)(y, F, U) \equiv \max \left\{ y + \delta U + (1 - \rho - \delta) \int V(y', F, U) Q(y, dy'), U - F \right\}.$$

I will show that $T(\mathcal{V}) \subseteq \mathcal{V}'$. The desired result then follows from Corollary 1 to the Contraction Mapping Theorem in Stokey and Lucas (1989) in conjunction with the fact that $\mathcal{V}$ is a complete metric space. To verify the claim that $T(\mathcal{V}) \subseteq \mathcal{V}'$, suppose $V \in \mathcal{V}$. Then TV is bounded and continuous by Lemma 9.5 in Stokey and Lucas. It remains to verify properties (a)–(c).

(a) Define

$$(CV)(y, F, U) \equiv y + \delta U + (1 - \rho - \delta) \int V(y', F, U) Q(y, dy').$$

As V is weakly increasing in y and Q is stochastically monotone, it follows that the integral is weakly increasing in y. Thus CV is strictly increasing in y. Set $\underline{y}(F, U)$ equal to the unique solution of the equation $(CV)(y, F, U) = U - F$. Then $(TV)(y, F, U) = U - F$ for $y \leq \underline{y}(F, U)$ and $(TV)(y, F, U)$ is strictly increasing in y for $y \geq \underline{y}(F, U)$.

(b) Consider $F^H, F^L \in \mathcal{F}$ with $F^H > F^L$. Since $0 \geq V(y', F^H, U) - V(y', F^L, U) \geq F^L - F^H$ for all $y' \in \mathcal{Y}$ it follows that $0 \geq (CV)(y, F^H, U) - (CV)(y, F^L, U) \geq (1 - \rho - \delta)(F^L - F^H)$. Since the value of separation drops by $F^H - F^L$ it follows that $0 \geq (TV)(y, F^H, U) - (TV)(y, F^L, U) \geq F^L - F^H$. Next consider the comparative statics of the separation threshold. As $(CV)(\underline{y}(F^L, U), F^L, U) = U - F^L$ it follows that $(CV)(\underline{y}(F^L, U), F^H, U) > U - F^H$, so it must be that $\underline{y}(F^H, U) < \underline{y}(F^L, U)$. It remains to show that the difference $(TV)(y, F^H, U) - (TV)(y, F^L, U)$ is weakly increasing in y. It is weakly increasing on $[0, \underline{y}(F^L, U)]$ because on this interval $(TV)(y, F^L, U) = U - F^L$ while $(TV)(y, F^H, U)$ is weakly increasing. For $y \geq \underline{y}(F^L, U)$ the difference is given by

$$\begin{aligned}
&(TV)(y, F^H, U) - (TV)(y, F^L, U) \\
&= (TC)(y, F^H, U) - (TC)(y, F^L, U) \\
&= (1 - \rho - \delta) \int \left[V(y', F^H, U) - V(y', F^L, U) \right] Q(y, dy')
\end{aligned}$$

and weakly increasing in y because $V(y', F^H, U) - V(y', F^L, U)$ is weakly increasing in y' and Q is stochastically monotone.

(c) The proof of property (c) proceeds in exactly the same way as the proof of property (b).

■

Proof of Lemma 1: Follows immediately from Lemma A. ■

Proof of Lemma 2:

(a) Using equation (1)

$$W^*_{NB}(y,F,U^H) - W^*_{NB}(y,F,U^L) = (1-\beta)(U^H - U^L) + \beta\left[V^*(y,F,U^H) - V^*(y,F,U^L)\right].$$

The second term is non-negative, bounded above by $\beta(U^H - U^L)$, and weakly decreasing in y by property (c) of Lemma A. Thus the sum is positive, bounded above by $U^H - U^L$, and weakly decreasing in y.

(b) Using equation (1)

$$W^*_{NB}(y,F^H,U) - W^*_{NB}(y,F^L,U) = \beta\left[V^*(y,F^H,U) - V^*(y,F^L,U) + (F^H - F^L)\right].$$

By property (b) of Lemma A the value of the match decreases but by less then $F^H - F^L$. Thus the change in worker utility is non-negative and bounded above $F^H - F^L$. From the change in the match value it inherits the property of being weakly increasing in y.

■

B Proofs of Lemmas 3– 5

I prove Lemmas 3–?? for a more general setting in which the wage is allowed to depend on match specific productivity

$$w(y,F,U) = w_{ID}(y,U).$$

Assumption 1 is adapted as follows.

Assumption B. *The wage function w_{ID} is continuous and satisfies the following properties.*

(a) $w_{ID}(y,U) > z$ for all $U \geq \frac{z}{\rho}$ and $y \in \mathcal{Y}$.

(b) Consider $U^H > U^L \geq \frac{z}{\rho}$. Then for all $y \in \mathcal{Y}$

$$0 \leq w_{ID}(y,U^H) - w_{ID}(y,U^L) \leq \rho(U^H - U^L).$$

(c) *Consider* y^H, $y^L \in \mathcal{Y}$ *with* $y^H > y^L$. *Then for all* $U \geq \frac{z}{\rho}$

$$0 \leq w_{ID}(y^H, U) - w_{ID}(y^L, U) < y^H - y^L.$$

The definition of the set $\mathcal{U}_{ID}$ is generalized to $\mathcal{U}_{ID} \equiv \{U | w_{ID}(0, U) > \rho U\}$, so with $U \in \mathcal{U}_{ID}$ any dismissal is involuntary.

Recall from appendix A that equilibrium utility from unemployment must lie in the bounded set $\mathcal{U}$. Thus I restrict the analysis of the separation decision and worker utility to the intersection $\mathcal{U}_{\cap ID} \equiv \mathcal{U} \cap \mathcal{U}_{ID}$.

The optimal stopping problem of the firm is

$$J^*_{ID}(y, F, U) = \max \left\{ y - w_{ID}(y, U) + (1 - \rho - \delta) \int J^*_{ID}(y', F, U) Q(y, dy'), -F \right\}.$$

and one obtains the following lemma.

Lemma B.1. *The joint value function* J^*_{ID} *is bounded, continuous, and has the following properties.*

(a) *For each* $(F, U) \in \mathcal{F} \times \mathcal{U}_{\cap ID}$ *there exists a unique threshold* $\underline{y}_{ID}(F, U) \in \mathbb{R}$ *such that* $J^*_{ID}(y, F, U)$ *equals* $-F$ *for* $y \leq \underline{y}_{ID}(F, U)$ *and is strictly increasing in* y *for* $y \geq \underline{y}_{ID}(F, U)$.

(b) *Fix* $U \in \mathcal{U}_{\cap ID}$. *Consider* $F^H, F^L \in \mathcal{F}$ *with* $F^H > F^L$. *Then* $\underline{y}_{ID}(F^H, U) < \underline{y}_{ID}(F^L, U)$. *The difference* $J^*_{ID}(y, F^H, U) - J^*_{ID}(y, F^L, U)$ *is non-positive, bounded below by* $F^L - F^H$, *and weakly increasing in* y.

(c) *Fix* $F \in \mathcal{F}$. *Consider* $U^H, U^L \in \mathcal{U}_{\cap ID}$ *with* $U^H > U^L$. *Then* $\underline{y}_{ID}(F, U^H) \geq \underline{y}_{ID}(F, U^L)$. *The difference* $J^*_{ID}(y, F, U^H) - J^*_{ID}(y, F, U^L)$ *is non-positive, bounded below by* $U^L - U^H$, *and weakly decreasing in* y.

Proof. Analogous to the proof of Lemma A. ■

Proof of Lemma 3: Follows immediately from Lemma B.1. ■

The next lemma establishes the key properties of the worker utility function W_{ID}. Recall that worker utility does not directly depend on firing costs, and the argument F is only carried along for notational consistency with Nash bargaining. Thus here I can treat W_{ID} as a function with domain $\mathcal{Y} \times \underline{\mathcal{S}} \times \mathcal{U}_{\cap ID}$, where $\underline{\mathcal{S}} \equiv \mathbb{R} \times [0, 1]$ is the set of possible separation rules.

Lemma B.2. *The worker utility function W_{ID} is bounded and has the following properties.*

(a) For $(\underline{s}, U) \in \underline{\mathcal{S}} \times \mathcal{U}_{\cap ID}$ with $\underline{s} = (\underline{y}, \underline{\lambda})$ worker utility $W_{ID}(y, \underline{s}, F, U)$ equals U for $y < \underline{y}$ and is weakly increasing in y.

(b) Fix $\underline{s} \in \underline{\mathcal{S}}$. Consider U^H, $U^L \in \mathcal{U}_{\cap ID}$ with $U^H > U^L$. Then $W_{ID}(y, \underline{s}, F, U^H) - W_{ID}(y, \underline{s}, F, U^L)$ is non-negative, bounded above by $U^H - U^L$, and weakly decreasing in y.

(c) Fix $U \in \mathcal{U}_{\cap ID}$. Consider $\underline{s}^L$, $\underline{s}^H \in \underline{\mathcal{S}}$ with $\underline{s}_L < \underline{s}_H$. Then $W_{ID}(y, \underline{s}^L, F, U) - W_{ID}(y, \underline{s}^H, F, U)$ is non-negative.

Proof. Let $\mathcal{W}_{ID}$ be the set of functions $W : \mathcal{Y} \times \underline{\mathcal{S}} \times \mathcal{U}_{\cap ID} \to \mathbb{R}$ satisfying all the properties stated in the lemma. Define the operator

$$\begin{aligned}&(TW)(y, \underline{s}, F, U)\\ &\equiv (1 - \lambda(y, \underline{s})) \left[w_{ID}(y, U) + \delta U + (1 - \rho - \delta) \int W(y', \underline{s}, F, U) Q(y, dy') \right] + \lambda(y, \underline{s}) U.\end{aligned}$$

where

$$\lambda(y, (\underline{y}, \underline{\lambda})) = \begin{cases} 0 & \text{if } y > \underline{y}, \\ \underline{\lambda} & \text{if } y = \underline{y}, \\ 1 & \text{if } y < \underline{y}. \end{cases}$$

I will show that $T(\mathcal{W}_{ID}) \subseteq \mathcal{W}_{ID}$. The desired result then follows from the Contraction Mapping Theorem in conjunction with the fact that $\mathcal{W}_{ID}$ is a complete metric space. To verify the claim that $T(\mathcal{W}_{ID}) \subseteq \mathcal{W}_{ID}$, suppose $W \in \mathcal{W}_{ID}$. Then TW is clearly bounded. It remains to verify properties (a)-(c).

(a) Since $\lambda(y, \underline{s}) = 1$ for $y < \underline{y}$ it follows that $(TW)(y, \underline{s}, F, U) = U$. Next consider $y^H, y^L \in \mathcal{Y}$ with $y^H > y^L$. We have

$$\begin{aligned}&(TW)(y^H, \underline{s}, F, U) - (TW)(y^L, \underline{s}, F, U)\\ &= (1 - \lambda(y^H, \underline{s})) \Bigg[w_{ID}(y^H, U) - w_{ID}(y^L, U)\\ &\quad + (1 - \rho - \delta) \left(\int W(y', \underline{s}, F, U) Q(y^H, dy') - \int W(y', \underline{s}, F, U) Q(y^L, dy') \right) \Bigg]\\ &\quad + \left(\lambda(y^L, \underline{s}) - \lambda(y^H, \underline{s}) \right) \Bigg[w_{ID}(y^L, U) - \rho U\\ &\quad + (1 - \rho - \delta) \int \left(W(y', \underline{s}, F, U) - U \right) Q(y^L, dy') \Bigg]\end{aligned}$$

The first term is non-negative since w_{ID} is weakly increasing in y, W is weakly increasing in y', and Q is stochastically monotone. The second term is non-negative as $w_{ID}(y,U) > \rho U$ for $U \in \mathcal{U}_{\cap ID}$, $W(y, \underline{s}, F, U) \geq U$ for all $(y, \underline{s}, U) \in \mathcal{Y} \times \underline{\mathcal{S}} \times \mathcal{U}_{\cap ID}$, and $\lambda(y, \underline{s})$ is weakly decreasing in y.

(b) We have

$$\begin{aligned}
&(TW)(y, \underline{s}, F, U^H) - (TW)(y, \underline{s}, F, U^L) \\
&= (1 - \lambda(y, \underline{s})) \left[w_{ID}(y, U^H) - w_{ID}(y, U^L) + \delta(U^H - U^L) \right] \\
&\quad + (1 - \lambda(y, \underline{s}))(1 - \rho - \delta) \int \left[W(y', \underline{s}, F, U^H) - W(y', \underline{s}, F, U^L) \right] Q(y, dy') \\
&\quad + \lambda(y, \underline{s})(U^H - U^L).
\end{aligned} \tag{B.1}$$

All three terms are non-negative. Moreover, since $w_{ID}(y, U^H) - w_{ID}(y, U^L) \leq \rho(U^H - U^L)$ and $W(y', \underline{s}, F, U^H) - W(y', \underline{s}, F, U^L) \leq U^H - U^L$, it follows that $(TW)(y, \underline{s}, F, U^H) - (TW)(y, \underline{s}, F, U^L) \leq U^H - U^L$.

(c) We have

$$\begin{aligned}
&(TW)(y, \underline{s}^L, F, U) - (TW)(y, \underline{s}^H, F, U) \\
&= (1 - \lambda(y, \underline{s}^L)) \int \left[W(y', \underline{s}^L, F, U) - W(y', \underline{s}^H, F, U) \right] Q(y, dy') \\
&\quad + \left(\lambda(y, \underline{s}^H) - \lambda(y, \underline{s}^L) \right) \Bigg[(w_{ID}(y, U) - \rho U) \\
&\quad + (1 - \rho - \delta) \int \left(W(y', \underline{s}^H, F, U) - U \right) Q(y, dy') \Bigg].
\end{aligned}$$

The first term is non-negative since W satisfies property (c). The second term is non-negative since $w_{ID}(y, U) > \rho U$ for $U \in \mathcal{U}_{\cap ID}$ and $W(y, \underline{s}, F, U) \geq U$ for all $(y, \underline{s}, U)$ in $\mathcal{Y} \times \underline{\mathcal{S}} \times \mathcal{U}_{\cap ID}$.

■

Proof of Lemma 4. Follows immediately from Lemma B.2. ■

Proof of Lemma 5. With the separation rule $\underline{s}^P$ all employed workers receive the same wage $w_{ID}(U)$ until they quit. Thus

$$W_{ID}(y, \underline{s}^P, F, U) = \frac{w_{ID}(U) + \delta U}{\rho + \delta} \tag{B.2}$$

for all $y \in \mathcal{Y}$. Thus $W_{ID}(y, \underline{s}^P, F, U) - W_{ID}(y, \underline{s}, F, U)$ is weakly decreasing in y because $W_{ID}(y, \underline{s}, F, U)$ is weakly increasing in y by property (a) of Lemma B.2. ■

C Proof of Lemma 6

Proof of Lemma 6. Combining condition (5) with equation (7) yields the condition

$$\rho U = z + (1-\rho)\theta q(\theta) \int \left[W_M(y, (\underline{y}_M(F,U), \underline{\lambda}), F, U) - U \right] dG_{new}(y). \tag{C.1}$$

As a first step I look for values of $U \in \mathcal{U}$ and $\underline{\lambda} \in [0,1]$ such that equation (C.1) is satisfied for a given value of θ. First fix $\underline{\lambda} = 0$ and consider the right hand side of equation (C.1). It is weakly decreasing as a function of U for both models of wage determination. For $M = NB$ this follows from property (a) of Lemma 2. For $M = ID$ the capital gain $\int \left[W_{ID}(y, (\underline{y}_{ID}(F,U), 0), F, U) - U \right] dG_{new}(y)$ is weakly decreasing in U by property (a) of Lemma 4, holding constant the separation threshold $\underline{y}_{ID}(F,U)$. Moreover, the threshold $\underline{y}_{ID}(F,U)$ is weakly increasing in U by Lemma 3, which further reduces the capital gain. The left hand side of equation (C.1) is strictly increasing in U, so it remains to show that the two must intersect. For $U = \underline{U}$ the left hand side equals z and is thereby lower than the right hand side. Since the left hand side increases without bound, it eventually exceeds the right hand side. If $M = NB$ the right hand side is independent of $\underline{\lambda}$ and continuous in U. It follows that there is a unique $\hat{U}(\theta) \geq \underline{U}$ such that equation (C.1) is satisfied if and only if $U = \hat{U}(\theta)$ and $\underline{\lambda} \in [0,1]$. For $M = ID$ the right hand side need not be continuous as a function of U when the separation probability is held constant at $\underline{\lambda} = 0$. A discontinuity at U can occur if the productivity level $\underline{y}_{ID}(F,U)$ is attained with positive probability at some point during the life of a match. If a small increase in utility from unemployment increases the separation threshold, then the right hand side jumps downward at U because staying employed is strictly better than unemployment. Nevertheless, the right hand side is left continuous. It follows that there is a unique $\hat{U}(\theta)$ such that the right hand side is weakly larger than the left hand side for $U \leq \hat{U}(\theta)$ and strictly smaller for $U > \hat{U}(\theta)$. Then there are two possibilities. If $\int W_{ID}(y, (\underline{y}_{ID}(F,U), \underline{\lambda}), F, U) dG_{new}(y)$ is independent of $\underline{\lambda}$, then the right hand side must in fact be continuous in U at $\hat{U}(\theta)$. In this case equation (C.1) is satisfied if and only if $U = \hat{U}(\theta)$ and $\underline{\lambda} \in [0,1]$. Otherwise $\int W_{ID}(y, (\underline{y}_{ID}(F,U), \underline{\lambda}), F, U) dG_{new}(y)$ is continuous and strictly decreasing in $\underline{\lambda}$ and there is a unique $\hat{\underline{\lambda}}(\theta) \in [0,1]$ to equalize the right and left hand sides, so $U = \hat{U}(\theta)$ and $\underline{\lambda} = \hat{\underline{\lambda}}(\theta)$ is the unique solution.

The function $\hat{U}(\theta)$ constructed above is continuous (the discontinuities discussed above result in flat parts of this function) and weakly increasing. Substituting this function into the right hand side of equation (6) yields the term $(1-\rho)q(\theta) \int J_M(y, \underline{s}_M(F, \hat{U}(\theta)), F, \hat{U}(\theta)) dG_{new}(y)$, which is continuous and strictly decreasing in θ. If it is strictly less than c for $\theta = 0$, then the equilibrium has $\theta_M^{eq}(F) = 0$ and $U_M^{eq}(F) = \frac{z}{\rho}$. Otherwise the assumption that $\lim_{\theta\to\infty} q(\theta) = 0$ insures that there is a unique value $\theta_M^{eq}(F)$ for which this term equals c. Equilibrium utility from unemployment is then given by $U_M^{eq}(F) = \hat{U}(\theta_M^{eq}(F))$. The equilibrium separation threshold is $\underline{y}_M^{eq}(F) = \underline{y}_M(F, U_M^{eq}(F))$. ■

D Proof of Lemmas 7 and 8

First some additional notation is introduced. Let $\mathcal{B}$ be the σ-algebra associated with the Markov process of match specific productivity, so the transition function is a mapping $Q : \mathcal{Y} \times \mathcal{B} \to [0,1]$. Let $\mathcal{B}_{all}$ be the σ-algebra $\mathcal{B}$ extended in the natural way to the enlarged state space $\mathcal{Y}_{all}$ defined in section 3.1. Next I derive the transition function that includes transitions between productivity states while employed as well as between employment and unemployment, denoted as $Q_{all}(\cdot|\underline{s},\theta) : \mathcal{Y}_{all} \times \mathcal{B}_{all} \to [0,1]$. First consider transitions within employment. For $y \in \mathcal{Y}$ and a set $Y \in \mathcal{B}$ we have

$$Q_{all}(y, Y|(\underline{y}, \underline{\lambda}), \theta) = \left(1 - \tilde{\delta}\right) \left[Q(y, Y \cap (\underline{y}, +\infty)) + (1 - \underline{\lambda})Q(y, Y \cap \{\underline{y}\})\right].$$

A match with productivity y after separation today survives quits at the beginning of next period with probability $1 - \tilde{\delta}$ where $\tilde{\delta} \equiv \frac{\delta}{1-\rho}$. Then it receives a new productivity draw, which may lead to endogenous destruction if the draw falls short of the threshold $\underline{y}$. Next consider transitions from unemployment. Here

$$Q_{all}(u, Y|(\underline{y}, \underline{\lambda}), \theta) = f(\theta) \left[\mu_{new}(Y \cap (\underline{y}, +\infty)) + (1 - \underline{\lambda})\mu_{new}(Y \cap \{\underline{y}\})\right]$$

where μ_{new} is the probability measure associated with the distribution function G_{new}. A worker unemployed after separation decisions in the current period must wait until next period to be matched again, and productivity in the new match must exceed $\underline{y}$ for the worker to remain employed after next period's separation decision.

For a probability measure μ_{all} on $(\mathcal{Y}_{all}, \mathcal{B}_{all})$ define

$$(T_{all}^*(\mu_{all}|\underline{s}, \theta))(Y) \equiv \int Q_{all}(y, Y|\underline{s}, \theta)\mu_{all}(dy),$$

that is $T_{all}^*(\cdot|\underline{s}, \theta)$ is the adjoint operator associated with Q_{all}. Let $T_{all}^{*n}(\cdot|\underline{s}, \theta)$ be the operator obtained if $T_{all}^*(\cdot|\underline{s}, \theta)$ is iterated n times.

Lemma D. *The operator T_{all}^* has a unique invariant probability measure, denoted as $\mu_{all}^{ss}(\cdot|\underline{s}, \theta)$, and $T_{all}^{*n}(\mu_{all})$ converges strongly to this invariant probability measure as $n \to \infty$ for any probability measure μ_{all} on $(\mathcal{Y}_{all}, \mathcal{B}_{all})$.*

Proof. Transitions from employment satisfy $Q_{all}(y,\{u\}|\underline{s},\theta) \geq \tilde{\delta}$ for all $y \in \mathcal{Y}$ while transitions from unemployment satisfy $Q_{all}(u,\{u\}|\underline{s},\theta) \geq 1 - f(\theta)$. Thus $Q_{all}(y,\{u\}|\underline{s},\theta) \geq \min\left[\tilde{\delta}, 1-\theta q(\theta)\right] > 0$ for all $y \in \mathcal{Y}_{all}$ where the strict inequality follows from the assumptions that $\delta > 0$ and $m(u,v) < \min[u,v]$. The lemma then follows immediately from Theorem 11.12 in conjunction with Exercises 11.5(a) and 11.4(c) in Stokey and Lucas (1989). ■

Proof of Lemma 7: Follows immediately from Lemma D. Here $G_{all}^{ss}(\cdot|\underline{s},\theta)$ is the distribution function associated with $\mu_{all}^{ss}(\cdot|\underline{s},\theta)$. ■

Now I turn to the distribution of match specific productivity across employed workers and the proof of Lemma 8. While this is of course just the distribution derived above conditional on employment, it is useful to derive it from a separate transition function. In steady state the mass of workers separating equals the mass of workers entering employment. Thus the distribution of productivity across employed workers can be computed from the transition function induced by Q when separated matches are replaced by matches with productivity drawn from μ_{new}. Of course this transition function does not exist if the separation rule is so high that all new matches separate immediately, that is if

$$h((\underline{y},\underline{\lambda})) \equiv \mu_{new}((\underline{y},+\infty)) + (1-\underline{\lambda})\mu_{new}(\{\underline{y}\}) = 0.$$

If $h(\underline{s}) > 0$ then this transition function is given by

$$\begin{aligned}
&Q_{emp}(y,Y|(\underline{y},\underline{\lambda})) \\
&= \left(1-\tilde{\delta}\right)\left[Q(y,Y\cap(\underline{y},+\infty)) + (1-\underline{\lambda})Q(y,Y\cap\{\underline{y}\})\right] \\
&+ \left(\tilde{\delta} + \left(1-\tilde{\delta}\right)\left[Q(y,[0,\underline{y})) + \underline{\lambda}Q(y,\{\underline{y}\})\right]\right)\frac{\mu_{new}(Y\cap(\underline{y},+\infty)) + (1-\underline{\lambda})\mu_{new}(Y\cap\{\underline{y}\})}{\mu_{new}((\underline{y},+\infty)) + (1-\underline{\lambda})\mu_{new}(\{\underline{y}\})}.
\end{aligned}$$

The first term of the sum is the probability of transiting to a productivity level in the set Y by surviving both quits and the separation decision at the beginning of next period. The second term of the sum is the probability of transiting to the set Y via replacement through new matches with a productivity level within that set. Thus this term is the product of the destruction rate and the probability of new matches having productivity in Y. Notice that the latter probability is conditional on a new match being formed.

Let $T_{emp}^{*}(\cdot|\underline{s})$ be the adjoint operator associated with $Q_{emp}(\cdot|\underline{s})$. Lemma D insures that $T_{emp}^{*}(\cdot|\underline{s})$ has a unique invariant distribution $\mu_{emp}^{ss}(\cdot|\underline{s})$ as long as $h(\underline{s}) > 0$.

Proof of Lemma 8. First consider the uninteresting case in which steady state employment is necessarily zero under the high separation rule, that is if $h(\underline{s}_H) = 0$. In this case by definition

$\mu^{ss}_{emp}(\cdot|\underline{s}_H)$ is degenerate with all mass at $+\infty$ (see footnote 16), so the statement of the lemma is correct.

Now turn to the case $h(\underline{s}_H) > 0$ which implies that $h(\underline{s}_L) > 0$. As a first step I show that $T^*_{emp}(\cdot|\underline{s}^H)$ dominates $T^*_{emp}(\cdot|\underline{s}^L)$ according to the definition of dominance in Müller and Stoyan (MS, 2002, p. 180). Using Theorem 5.2.5 in MS dominance can be verified by showing that $Q_{emp}(y,[0,y']|\underline{s}^H) \leq Q_{emp}(y,[0,y']|\underline{s}^L)$ for all $y, y' \in \mathcal{Y}$. As usual write $\underline{s}^H = (\underline{y}^H, \underline{\lambda}^H)$ and $\underline{s}^L = (\underline{y}^L, \underline{\lambda}^L)$. For $y' < \underline{y}_H$ the desired result follows immediately as $Q_{emp}(y,[0,y']|\underline{s}^H) = 0$. So consider the case $y' \geq \underline{y}_H$. First it is helpful to note that

$$\frac{\mu_{new}((\underline{y}_H, y']) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})}{\mu_{new}((\underline{y}_H, +\infty)) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})} \leq \frac{\mu_{new}((\underline{y}_L, y']) + (1-\underline{\lambda}_L)\mu_{new}(\{\underline{y}_L\})}{\mu_{new}((\underline{y}_L, +\infty)) + (1-\underline{\lambda}_L)\mu_{new}(\{\underline{y}_L\})}.$$

Thus it is enough to show that

$$\begin{aligned}
&\left(1-\tilde{\delta}\right)\left[Q(y,(\underline{y}_H, y']) + (1-\underline{\lambda}_H)Q(y,\{\underline{y}_H\})\right] \\
&+ \left(\tilde{\delta} + \left(1-\tilde{\delta}\right)\left[Q(y,[0,\underline{y}_H)) + \underline{\lambda}_H Q(y,\{\underline{y}_H\})\right]\right) \frac{\mu_{new}((\underline{y}_H, y]) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})}{\mu_{new}((\underline{y}_H, +\infty)) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})} \\
\leq &(1-\tilde{\delta})\left[Q(y,(\underline{y}_L, y']) + (1-\underline{\lambda}_L)Q(y,\{\underline{y}_L\})\right] \\
&+ \left(\tilde{\delta} + \left(1-\tilde{\delta}\right)\left[Q(y,[0,\underline{y}_L)) + \underline{\lambda}_L Q(y,\{\underline{y}_L\})\right]\right) \frac{\mu_{new}((\underline{y}_H, y]) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})}{\mu_{new}((\underline{y}_H, +\infty)) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})}.
\end{aligned}$$

Collecting terms, this condition reduces to

$$\begin{aligned}
&\left[Q(y,[\underline{y}_L, \underline{y}_H)) + \underline{\lambda}_H Q(y,\{\underline{y}_H\}) - \underline{\lambda}_L Q(y,\{\underline{y}_L\})\right] \frac{\mu_{new}((\underline{y}_H, y]) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})}{\mu_{new}((\underline{y}_H, +\infty)) + (1-\underline{\lambda}_H)\mu_{new}(\{\underline{y}_H\})} \\
\leq &\left[Q(y,[\underline{y}_L, y_H)) + \underline{\lambda}_H Q(y,\{\underline{y}_H\}) - \underline{\lambda}_L Q(y,\{\underline{y}_L\})\right]
\end{aligned}$$

which is satisfied. Now let μ be a probability measure on $(\mathcal{Y}, \mathcal{B})$. By Theorem 5.2.2. in MS

$$T^{*n}_{emp}(\mu|\underline{s}^H) \geq_{FSD} T^{*n}_{emp}(\mu|\underline{s}^L)$$

for all $n \geq 0$. Since first order stochastic dominance is closed with respect to strong convergence, it follows that

$$\mu^{ss}_{emp}(\cdot|\underline{s}_H) \geq_{FSD} \mu^{ss}_{emp}(\cdot|\underline{s}_L).$$

■

E Proof of Lemmas 9–11 and Proposition 1

Proof of Lemma 9. First note that F^L_0, $F^H_0 \in \mathcal{F}^{NB}$ implies $U^{eq}_{NB}(F^H_0) \leq U^{eq}_{NB}(F^L_0)$. Then parts (b) and (c) of Lemma A imply that $\underline{y}^{eq}_{NB}(F^H_0) = \underline{y}_{NB}(F^H_0, U^{eq}_{NB}(F^H_0)) < \underline{y}_{NB}(F^L_0, U^{eq}_{NB}(F^L_0))$.

This in turn implies implies $\underline{s}_0^H \leq \underline{s}_0^L$. The result now follows from Lemma 8. ■

Proof of Lemma 10. Suppose $F^L \notin \mathcal{F}_{NB}$. Then there exists $F^H \in \mathcal{F}$ such that $F^H > F^L$ and $U_{NB}^{eq}(F^H) > U_{NB}^{eq}(F^L)$. Thus

$$\begin{aligned} &\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L) \\ &= \left[W_{NB}(y, F^H, U_{NB}^{eq}(F^H)) - W_{NB}(y, F^H, U_{NB}^{eq}(F^L))\right] \\ &\quad + \left[W_{NB}(y, F^H, U_{NB}^{eq}(F^L)) - W_{NB}(y, F^L, U_{NB}^{eq}(F^L))\right]. \end{aligned} \tag{E.1}$$

Property (a) of Lemma 2 implies that the first term is positive, while property (b) insures that the second term of the sum is non-negative. Thus all employed workers as well as unemployed workers strictly benefit from an increase of firing costs from F^L to F^H. This immediately implies $F^L \notin \mathcal{P}_{NB,emp}(F_0)$ and $F^L \notin \mathcal{P}_{NB,all}(F_0)$. ■

Proof of Lemma 11. Since $F^L, F^H \in \mathcal{F}_{NB}$ it follows that $U_{NB}^{eq}(F^H) \leq U_{NB}^{eq}(F^L)$. Property (a) of Lemma 2 implies that the first term of equation (E.1) is weakly increasing in y, while property (b) insures that the second term is weakly increasing in y. ■

Proof of Proposition 1. Suppose $F^L \in \mathcal{P}_{NB,emp}(F_0^L)$ and $F^H \in \mathcal{P}_{NB,emp}(F_0^H)$ with $F^H > F^L$. Since $F^L \in \mathcal{P}_{NB,emp}(F_0^L)$ it follows that there exists $\underline{s}_0^L \in \underline{s}_{NB}^{eq}(F_0^L)$ such that

$$\int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^L) \leq 0.$$

Similarly $F^H \in \mathcal{P}_{NB,emp}(F_0^H)$ implies that there exists $\underline{s}_0^H \in \underline{s}_{NB}^{eq}(F_0^H)$ such that

$$\int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^H) \geq 0.$$

By Lemma 9 it follows that $G_{emp}^{ss}(\cdot|\underline{s}_0^H) \leq_{FSD} G_{emp}^{ss}(\cdot|\underline{s}_0^L)$. As $F^H > F^L$ the difference $\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)$ is weakly increasing in y by Lemma 11. This yields the inequality

$$\int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^L) \geq \int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^H).$$

Together these three inequalities imply

$$\begin{aligned} &\int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^L) \\ &= \int \left[\mathcal{W}_{NB}(y, F^H) - \mathcal{W}_{NB}(y, F^L)\right] dG_{emp}^{ss}(y|\underline{s}_0^H) = 0. \end{aligned}$$

Hence $F^H \in \mathcal{P}_{NB,emp}(F_0^L)$ and $F^L \in \mathcal{P}_{NB,emp}(F_0^H)$.

F Proof of Lemmas 12, 13, 15, and Proposition 2

Proof of Lemma 12. Consider $F \in \mathcal{F}$ and suppose $w_{ID}(U^{eq}_{ID}(F)) \leq \rho U^{eq}_{ID}(F)$. Then the capital gain from finding a job is zero and equation (7) implies $U^{eq}_{ID}(F) = \frac{z}{\rho}$. But this contradicts part (a) of Assumption 1 according to which $w_{ID}(U^{eq}_{ID}(F)) > z$. ■

Proof of Lemma 13. Let $U^H = U^{eq}_{ID}(F^H)$ and $U^L = U^{eq}_{ID}(F^L)$. Suppose that the separation threshold does not decrease, so $\underline{s}^H > \underline{s}^L$. As a first step I show that this implies $U^H > U^L$. This is because $U^L \leq U^H$ would imply $\underline{y}_{ID}(F^H, U^H) < \underline{y}_{ID}(F^L, U^L)$ by Lemma 3, contradicting $\underline{s}^H > \underline{s}^L$. As a second step I show that $\underline{s}^H > \underline{s}^L$ together with $U^H > U^L$ yields a contradiction using the equilibrium conditions. Since $\int J_{ID}(y, \underline{s}_{ID}(F, U), F, U) dG_{new}(y)$ is weakly decreasing in U and F by Lemma B.1, condition (6) implies that $\theta^{eq}_{ID}(F^H) \leq \theta^{eq}_{ID}(F^L)$. However, given that $\underline{s}^H > \underline{s}^L$ and $\theta^{eq}_{ID}(F^H) \leq \theta^{eq}_{ID} F^L)$ condition (7) implies that $U^H \leq U^L$. ■

Proof of Lemma 15. The utility difference can be written as

$$\begin{aligned}\mathcal{W}_{ID}(y, F^P) - \mathcal{W}_{ID}(y, F^L) &= \left[W_{ID}(y, \underline{s}^P, U^{eq}_{ID}(F^P), F^P) - W_{ID}(y, \underline{s}^P, U^{eq}_{ID}(F^L), F^L)\right] \\ &\quad + \left[W_{ID}(y, \underline{s}^P, U^{eq}_{ID}(F^L), F^L) - W_{ID}(y, s^{eq}_{ID}(F^L), U^{eq}_{ID}(F^L), F^L)\right]\end{aligned}$$

Equation (B.2) implies that the first term is independent of y. The second term is weakly decreasing in y by Lemma 5 for $y \in \mathcal{Y}$. ■

Proof of Proposition 2. Suppose $F^P \in \mathcal{P}_{ID,emp}(F^L_0)$. Then there exists $\underline{s}^L_0 \in \underline{s}^{eq}_{ID}(F^L_0)$ such that

$$\int \left[\mathcal{W}_{ID}(y, F^P) - \mathcal{W}_{ID}(y, F)\right] dG^{ss}_{emp}(y|\underline{s}^L_0) \geq 0.$$

for all $F \in \mathcal{F}$. Now pick any $\underline{s}^H_0 \in \underline{s}^{eq}_{ID}(F^H_0)$. By Lemma 13 one has $G^{ss}_{emp}(\cdot|\underline{s}^L_0) \geq_{FSD} G^{ss}_{emp}(\cdot|\underline{s}^H_0)$. Thus

$$\int \left[\mathcal{W}_{ID}(y, F^P) - \mathcal{W}_{ID}(y, F)\right] dG^{ss}_{emp}(y|\underline{s}^H_0) \geq 0.$$

for all $F \in \mathcal{F}$. Thus $F^P \in \mathcal{P}_{ID,emp}(F^H_0)$. ■

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