Does Employment Protection Create Its Own Political Support?
The Role of Wage Determination

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Abstract

The stringency of employment protection regulations varies substantially across countries. In this paper I explore a parsimonious explanation for the extent and persistence of this variation: the ability of employment protection to generate its own political support. Using a version of the Mortensen-Pissarides model of job creation and destruction, I show that the presence or absence of this ability depends crucially on the features of wage determination. Under the standard assumption of continuous time Nash bargaining, workers value employment protection because it strengthens their hand in bargaining. Workers in high productivity matches see their bargaining position enhanced most significantly. Furthermore, their low likelihood of becoming unemployed shelters them from the adverse consequences of employment protection. Yet by reducing turnover employment protection shifts the distribution of match-specific productivity toward lower values. This is a shift toward workers that have little taste for employment protection. Bilaterally inefficient separations are a feature of wage setting that can partially reverse this negative result. Now workers value employment protection because it delays involuntary dismissals. Workers in low productivity matches stand to gain the most since they face the highest risk of layoff. Again employment protection shifts the productivity distribution toward lower values. However, now this is a shift toward ardent supporters of employment protection.

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JEL Classification: E24, J41, J65

Most countries have adopted regulations that make it costly for employers to dismiss workers. The extent of such regulations varies substantially across countries. Differences in employment protection regulations also appear to be quite persistent over time. It is often argued that employment protection has large impacts on labor market performance.[1] What is the source of these differences in regulation?

While employment protection legislation exhibits substantial persistence, it is not immutable. Reforms in either direction are a regular occurrence. Moreover, attempts of reform are often accompanied by severe political conflict.[2] This suggests that it is useful to view the extent of employment protection within a country as the outcome of a political process. The question then becomes: what are the sources of variation in the political support for employment protection across countries?

In this paper I will explore a very parsimonious explanation for the extent and persistence of this variation: the possibility that employment protection has the ability to generate its own political support. If high employment protection in the past induces strong support for employment protection today, this provides a mechanism toward amplification and persistence that could already go a long way in accounting for the variation in employment protection across countries.

Are there mechanisms that allow employment protection to create its own political support? The answer will also contribute to an understanding of the current debate about labor market reform. In particular, the notion that employment protection creates its own political support is implicit in some arguments put forward in this debate.

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[1]Botero et al. (2003) recently constructed indicators of legal protection against dismissal for a sample of 85 countries. The World Bank (2003) uses their methodology to obtain indicators for a sample of more than 130 countries. There is little systematic evidence on persistence, Blanchard and Wolfers (2000) make an attempt to construct time series of the stringency of employment protection for a group of OECD countries. The effect of employment protection on labor market performance is quite controversial, Addison and Teixeira (2003) survey the available evidence.

[2]Bertola, Boeri, and Cazes (1999) provide an overview of major changes in employment protection regulations for a group of OECD countries. Krueger (2002) provides a vivid account of the political conflict induced by a recent proposal to relax firing restrictions in Italy.

Consider for example the popular advice that reforms should leave existing employment relationships untouched.[3] The idea is that the old stock of employment relationships will gradually disappear and eventually all jobs are subject to less employment protection. But for this scheme to work, it must be the case that workers in the new flexible economy display less of a taste for employment protection than the workers in the pre-reform economy, for otherwise the former would prefer a return to the old ways.

I will examine the ability of employment protection to create its own political support within a version of the Mortensen-Pissarides model of job creation and destruction (Mortensen and Pissarides (1994), Pissarides (2000)). The primary focus will be on the support provided by *employed* workers, since they are the principal beneficiaries of employment protection. I will show that the answer depends crucially on the way in which wages are determined: depending on the features of wage setting, the support provided by employed workers can be increasing or decreasing in the extent of past employment protection.

The Mortensen-Pissarides model is a natural starting point: it has become the standard theory of equilibrium unemployment and has been a popular tool to study the effects of various policies, including employment protection, on labor market performance. It easily accommodates different modes of wage determination. The model also generates plausible and intuitive differences among workers in their preferences for employment protection. Workers are identical. However, at a point in time identical workers may find themselves in very different positions. First, their employment status

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[3] "One possibility to overcome this stalemate may be to leave existing contracts intact, but to allow current 'outsiders' to opt out of existing arrangements and conclude mutually beneficial contracts with employers willing to do so." (IMF (1999), p.121)

The type of reform implemented by many Western European countries over the last two decades does not quite follow this advice. This type of reform tends to leave the regulation of *standard* (permanent) employment contracts unchanged but reduces restrictions on *nonstandard* employment such as fixed-term contracts. Such a reform will not lead to the gradual disappearance of highly protected employment relationships. Instead standard and nonstandard forms of employment will coexist. See Blanchard and Landier (2002) for an analysis of the economic effects of this type of reform.

may differ: some workers have jobs while others are unemployed. Second and crucial for my purposes, employed workers may find themselves in very different situations as well. Firm-worker matches are subject to idiosyncratic productivity shocks. As a consequence, some employed workers are in matches with high productivity while others are employed in low productivity matches. Higher match-specific productivity makes it less likely that a worker will be dismissed in the near future and thereby affects his taste for employment protection.

How is employment protection introduced into this model? The literature has drawn a distinction between two dimensions of employment protection.[4] First, severance payments require the firm to make a transfer to the worker upon separation. Second, a firm typically has to obey a set of administrative restrictions and procedures if it wants to dismiss workers. These restrictions are usually modelled as wasteful firing costs (a tax on dismissals that is a pure deadweight loss). I allow employment protection to come in both guises.[5]

How could employment protection create its own political support within the Mortensen-Pissarides model? I show that across different modes of wage setting one thing remains unchanged: employment protection shifts the distribution of match-specific productivity toward lower values. This is intuitive: employment protection slows down the process of job creation and destruction. As a consequence workers and firms will be less well matched.

Now suppose workers in matches with *low* productivity are the most ardent supporters of employment protection. Then strict employment protection in the past will place many workers into low productivity matches. These workers in turn provide strong support for employment protection today. Exactly the opposite will be true if workers

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[4]See Garibaldi and Violante (2002).

[5]The relative importance of the two components is not clear. For the case of Italy Garibaldi and Violante estimate that for a blue collar worker with average tenure the transfer component is twice as large as the wasteful component. It should be safe to say that both components are economically significant.

in matches with *high* productivity are the most eager supporters of employment protection. A larger number of workers in low productivity matches then translates into low support for employment protection.

The importance of wage setting is now easy to appreciate: it determines whether workers in high productivity matches or their counterparts in matches with low productivity stand to gain most from employment protection.

At a fundamental level wage setting determines the channels through which employed workers may gain from employment protection. It is often pointed out that employment protection enhances the bargaining power of workers, enabling them to ask for higher wages.[6] This first channel will be referred to as the *appropriation* effect of employment protection.

The second channel that I will introduce is perhaps more subtle. Employment protection prolongs the duration of jobs. Is this of any value to the worker? The answer is no if separations are bilaterally efficient and voluntary from the perspective of the worker. In this case the timing of separation is optimal from the worker's viewpoint and there are no gains from manipulating job duration. But the answer changes if wages are determined such that separations are bilaterally inefficient and premature from the perspective of the worker. (From now on I will refer to this constellation as bilaterally inefficient separations, it being understood that it is the worker who is dismissed involuntarily.) Now the worker would ideally want to manipulate the timing of separation directly. However, being unable to do so he stands to gain if this goal is achieved indirectly through an increase in employment protection. This second channel will be referred to as the *prolongation* effect of employment protection.

These are the two channels through which employed workers can gain from employment protection. But the possibility of gains through one or both of these channels does not imply that employed workers will always push for more employment protection. This is because in general equilibrium employment protection makes unemployed work-

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

ers worse off. The utility of the unemployed pins down the alternative wage of employed workers. By reducing this alternative wage, employment protection will adversely affect the employed. This will be referred to as the *backlash* effect of employment protection.[7] Once again wage setting plays a crucial role: it determines how sensitive the utility of employed workers is to changes in the utility of unemployed workers, and how this sensitivity varies with the level of match-specific productivity.

The mode of wage setting most commonly employed in versions of the Mortensen-Pissarides model is continuous time Nash bargaining: the surplus of the match is split between the worker and the firm according to a Nash sharing rule *at all times*. It is useful to consider this mode of wage determination for two reasons. First, it has been in widespread use to examine the economic implications of employment protection. Thus the examination of how continuous time Nash bargaining shapes the political support for employment protection is an interesting endeavor in its own right. Second, continuous time Nash bargaining is useful from an analytical perspective because it isolates one of the two channels through which workers gain from employment protection. Since separations are bilaterally efficient the prolongation effect is not active.[8] Employment protection will still prolong the duration of jobs, but this is not valued by workers. This leaves only the appropriation effect as a source of gains from employment protection.

Under Nash bargaining employment protection enhances the bargaining position of the worker both by improving his outside opportunity and by reducing the outside

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[7]As I will discuss in detail later, it would not be correct to refer to the backlash effect as *the* general equilibrium effect of employment protection. It is a part of the general equilibrium effect but not the entire general equilibrium effect: the prolongation effect also has a general equilibrium component. Similarly while the appropriation effect is a partial equilibrium effect, it is not the entire partial equilibrium effect: if firing costs are wasteful, the prolongation effect also has a partial equilibrium component.

[8]That bargaining occurs at all times during the life of the match is important to obtain bilaterally efficient separations. In Blanchard and Portugal (2001) Nash bargaining takes place only once, in the instant after the firm has hired the worker. It is assumed that the wage chosen at this point is not renegotiated in response to shocks to match-specific productivity, so separations are in general bilaterally inefficient.

opportunity of the firm. It turns out that workers in high productivity matches gain at least as much from this improvement in their bargaining position as workers in matches with low productivity. At the same time they are less affected by the fall in the utility of the unemployed, because they are less likely to face unemployment in the near future. Thus workers in high productivity matches are the primary beneficiaries of employment protection. It follows that employment protection is not able to generate its own political support, since it shifts the distribution of productivity toward lower values.

Interestingly, this argument extends beyond the realm of employment protection. Under Nash bargaining the worker receives a share of the surplus of the match. Many authors have assumed that labor market regulation enhances the bargaining position of workers by increasing the share of the surplus that workers are able to appropriate.[9] I show that policies boosting *surplus appropriation* are unable to create their own political support for the same reason as employment protection: they are supported by workers in high productivity matches but shift the distribution of productivity toward lower values.

The inability of employment protection to create its own political support under the standard assumption of continuous time Nash bargaining is the first point I would like to make in this paper. It naturally leads to the following question: What features of wage setting will enable employment protection to generate its own support? I will show that bilaterally inefficient separations have some potential in this respect.

I introduce bilaterally inefficient separations in a very simple way by assuming that there is a wedge between the wage received by an employed worker and his alternative wage that cannot be negotiated away. As discussed above, this activates the prolongation effect as a channel through which workers can benefit from employment protection. It is easy to see that workers in low productivity matches gain most from an *increase* in job duration. In particular, a worker on the margin of being dismissed experiences the gain

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[9]Mortensen and Pissarides (1999a) consider a model in which collective bargaining enables monopoly unions to determine the share of workers in the surplus. Blanchard and Giavazzi (2003) study macroeconomic effects of deregulation in product and labor markets, taking labor market regulation to determine the share of workers in bargaining.

from delayed separation immediately. Conversely, for a worker in a high productivity match it is unlikely that he will face dismissal in the near future, so for him the gains from delayed separation are rather remote.

However, it is not generally true that workers in low productivity matches lose most from a *decrease* in employment protection. In particular, a worker on the margin of being dismissed suffers little from deregulation, simply because that worker would have immediately lost his job even in the absence of deregulation. As a consequence, the losses from a reduction in employment protection are not monotone in productivity. Thus the argument that bilaterally inefficient separations enable employment protection to generate its own support is theoretically not as clear cut as the negative result in the case of continuous time Nash bargaining.

To my knowledge the present paper is the first to analyze the structure of political support for employment protection in the standard Mortensen-Pissarides model with continuous time Nash bargaining. More generally, it is the first to examine the ability of employment protection to generate its own political support in a setup where workers benefit through an enhancement of their bargaining position rather than through longer job duration.

On the other hand, I'm not the first to argue that employment protection may generate its own political support when workers benefit through an increase in job duration. Here my contribution is more subtle. Saint-Paul (2002) recently obtained this result in a model of job creation and destruction with vintage capital. He emphasizes that it is the presence of labor market rents (defined as the utility difference between employed and unemployed workers) that makes job duration valuable and thereby enables employment protection to generate its own political support. Yet my analysis of continuous time Nash bargaining shows that rents *per se* cannot be the driving force: here workers earn rents but they do not value job prolongation. Instead I trace the value of job prolongation more narrowly to bilaterally inefficient separations: not rents as such but bilaterally inefficient separations may enable employment protection to generate its own

political support.[10]

Other closely related research includes Vindigni (2002), who examines how the extent of idiosyncratic uncertainty affects the political support for employment protection. Koeniger and Vindigni (2003) develop a model in which more regulated product markets are associated with stronger support for employment protection. Boeri and Burda (2003) take the extent of firing costs as given and examine how it influences the political support for rigid modes of wage determination. Boeri, Conde-Ruiz, and Galasso (2003) provide a political economy analysis of the trade-off between employment protection and unemployment benefits.

More generally this paper is part of a strand of literature that has examined whether various policies have the ability to create their own political support. Hassler et al. (2001) are concerned with unemployment insurance, Coate and Morris (1999) consider policies such as subsidies and price controls that favor certain sectors of the economy. Both Benabou (2000) and Hassler et al. (2003) deal with income redistribution. Acemoglu and Robinson (2001) develop a theory in which the ability of inefficient redistributional policies to create their own political support enables these policies to survive despite the availability of more efficient modes of redistribution.

The remainder of the paper is organized as follows. In section 1 I introduce a version of the Mortensen-Pissarides model of job creation and destruction. The political setup is described in section 2. Section 3 analyzes which workers gain most from employment protection. In section 4 I analyze how this translates into the ability of employment protection to generate its own political support. Section 5 concludes.

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[10]Saint-Paul does not discuss the role of bilaterally inefficient separations. In fact, in his model wages are determined by continuous time Nash bargaining (specifically, the special case in which the worker is able to appropriate the entire surplus). As a consequence separations should be bilaterally efficient and longer job duration should not be valued. In his analysis bilaterally inefficient separations arise due to an error in computing the wage implied by bargaining: in some instances the calculated wage is too high, leading to separations that are premature from the perspective of workers.

1 A Model of Job Creation and Job Destruction

In this section I introduce a version of the Mortensen-Pissarides (1994) model of job creation and destruction. The basic structure of the model economy is described in subsection 1.1. The specification of wage setting is of central importance and is described in subsection 1.2. I start with the standard assumption about wage determination in the Mortensen-Pissarides framework: continuous time Nash bargaining. Then I introduce a specification of wage setting that will induce bilaterally inefficient separations. The general specification of wage setting used in this paper will nest both Nash bargaining and bilaterally inefficient separations.

The economy will be subject to different types of labor market regulation. The focus is on employment protection both in the form of wasteful firing costs and severance payments. For the purpose of comparison, I also allow labor market regulation to enhance the bargaining position of workers by increasing the share of the match surplus that workers are able to appropriate. Subsection 1.3 summarizes the different types of labor market regulation that affect the economy.

The model economy is assumed to experience a single unanticipated change in labor market regulation at time $t = 0$. Here this change is taken as exogenous, in the following sections it will be the outcome of a political decision. Apart from this single change both regulation and all model parameters are constant throughout. The labor market regime prevailing before the change is denoted at λ_0, and at time $t = 0$ the economy is assumed to be in the steady state induced by this regime. The new labor market regime is denoted as λ.

In subsection 1.4 I analyze the partial equilibrium separation decision and examine how it depends on the features of wage setting. In subsection 1.5 I compute the general equilibrium path of the economy after the change in labor market regulation. In particular, I will compute the utility of workers at time $t = 0$ as a function of the continuing level of labor market regulation. Later this function will represent preferences for labor market regulation in the political economy analysis.

In subsection 1.6 I will compute the steady state induced by initial labor market regulation λ_0. Later in the paper it will be shifts in this initial distribution of productivity that will allow initial regulation to affect the political outcome at time $t = 0$.

1.1 Basic Features

There is a continuum of infinitely lived workers of mass one. At a point in time a worker is either employed or unemployed. The production structure of the economy consists of many firm-worker matches, each composed of one worker and one firm. At each point in time some existing firm-worker matches are destroyed and some new matches are created.

Creation. Creating a new match is costly. In particular, a firm hiring a worker at time t incurs costs $c(h(t)) = c_I + c_S(h(t))$ where $h(t)$ is the hiring rate at time t. The first component $c_I > 0$ is a fixed cost of investment. The second component $c_S(h(t))$ is a reduced form specification for the search costs implied by a constant returns to scale matching function.[11] Search costs are strictly increasing and satisfy $\lim_{h \to \infty} c_S(h) = +\infty$. Intuitively, at times of intense hiring it is more difficult for firms to find workers, leading to higher search costs.

Destruction. A firm-worker match has a strictly positive scrapping value X. I assume that $X \leq c_I$, so at best the fixed cost of investment can be recouped. The scrapping value is divided between the worker and the firm in the following way. The firm has to pay firing costs of $\gamma(\lambda)X$. The fraction paid as firing costs $\gamma(\lambda) \in [0, 1]$ is determined by

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[11]Let $H = m(u, v)$ where H is hiring, u is unemployment, v is the number of vacancies and m is a concave constant returns to scale matching function increasing in both arguments. Assume that a vacancy is associated with costs c_S per unit of time. Let $\theta = \frac{v}{u}$ be labor market tightness and let $h = \frac{H}{u}$ be the hiring rate. By homogeneity of degree one $h = m(1, \theta)$ and one can invert this relationship to obtain a function $\theta = \Theta(h)$ where Θ is increasing. Expected search costs associated with a new vacancy are then given by $\frac{c_S}{m\left(\frac{1}{\theta}, 1\right)} = \frac{c_S}{m\left(\frac{1}{\Theta(h)}, 1\right)}$. Also see Pissarides (2000).

labor market regulation λ. The restriction $\gamma(\lambda) \leq 1$ reflects the implicit assumption that the firm cannot be forced to relinquish more than the scrapping value.[12] The worker receives a fraction ρ of firing costs as a transfer $T(\lambda) \equiv \rho\gamma(\lambda)X$ where $\rho \in [0, 1]$. This is the severance payment. The remaining fraction of firing costs $(1 - \rho)\gamma(\lambda)X$ is wasted. It is useful to define $R(\lambda) \equiv \rho\gamma(\lambda)X + (1 - \gamma(\lambda))X$ as the part of the scrapping value that remains after wasteful firing costs have been deducted. I assume that the share of firing costs paid as severance payments ρ is fixed in the sense that it is not affect by labor market regulation. In the extreme case $\rho = 0$ severance payments $T(\lambda)$ are zero and the only effect of firing costs is to waste part of the scrapping value. In the other extreme $\rho = 1$ there is no waste, that is $R(\lambda) = X$, and all firing costs go the worker in the form of the severance payment $T(\lambda)$.

Idiosyncratic Uncertainty. All new matches start with the same productivity $y_0 > 0$, but subsequently they are subject to idiosyncratic productivity shocks. I will deviate from Mortensen and Pissarides (1994) by using a different stochastic process for match productivity. The purpose of this deviation is to capture the idea that workers in matches with high productivity face a lower incidence of unemployment.

In the original Mortensen-Pissarides model productivity changes occur with a fixed Poisson arrival rate. If a change occurs, the new productivity is drawn from a fixed distribution with distribution function $F(y)$. Destruction occurs if the new productivity falls short of the reservation productivity. This process exhibits persistence because the current productivity applies until a change occurs. But conditional on change, the old productivity does not affect the distribution from which the new productivity is drawn. This implies that all workers are equally likely to become unemployed, regardless of whether current match-specific productivity is high or low. In this specific sense the persistence of match productivity in the original Mortensen-Pissarides model is degenerate. Their stochastic process could be generalized by assuming that the new

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[12]It is reasonable to assume that there is an upper bound on the amount of firing costs that can be extracted from a firm, and this specification generates this upper bound in a natural way.

productivity is drawn from a distribution with distribution function $F(y, y')$ and that the old productivity y' shifts $F(y, y')$ toward larger values. This would insure that workers in high productivity matches are less likely to become unemployed. I will achieve the same goal in a more tractable way by assuming that match productivity follows a geometric Brownian motion.[13] In addition I allow for the possibility that productivity jumps to zero with Poisson arrival rate $\delta \geq 0$.[14] In Appendix A I describe the stochastic process of match productivity more formally. In particular I state the conditions on the parameters that insure the existence of a stationary distribution, which I assume to be satisfied throughout the paper.

Transitional Dynamics. Recall that at time $t = 0$ the economy experiences an unanticipated change in labor market regulation. No further changes in labor market regulation or other parameters of the model are expected after time $t = 0$. A convenient feature of the Mortensen-Pissarides model is that it has very simple transitional dynamics.[15] In particular both the hiring rate and the utility of the unemployed immediately jump to their new steady state values. Only the level of employment and the production structure adjust slowly to the new steady state.

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[13]Bentolila and Bertola (1990) first employed a geometric Brownian motion to examine the effects of firing costs in a partial equilibrium setting. Vindigni (2002) recently utilized the geometric Brownian motion to examine how the extent of idiosyncratic uncertainty affects the political support for employment protection.

[14]This addition is made for two reasons. First $\delta > 0$ insures the existence of a stationary productivity distribution irrespective of the parameters of the geometric Brownian motion. With $\delta = 0$ a stationary distribution may still exist, but only if the trend μ is not too large relative to volatility σ. See appendix A for details. Second, with this addition my specification includes the productivity process of Saint-Paul (2002) as a special case. In his model productivity is constant and exogenous destruction occurs at rate δ. However, the productivity of new matches is growing at rate g. This is isomorphic to the special case of my specification in which volatility is zero, productivity falls at rate g and exogenous failure occurs at rate δ (one also needs to replace the subjective discount rate r by $r - g$ if one wants to get the comparative statics with respect to g correctly).

[15]See Pissarides (2000), pp. 59–63.

1.2 Wage Determination

First I will compute the joint value of a match. Then I will discuss how wage setting determines the way in which this value is split between the firm and the worker.

As discussed at the end of the previous section, the utility of unemployed workers is constant along the equilibrium path; let U denote this constant utility level. In the event of separation an employed worker receives the utility of an unemployed worker and collects the severance payment, so his total outside opportunity is given by $U + T(\lambda)$. The firm receives the remaining scrapping value less the severance payment, that is $R(\lambda) - T(\lambda)$. The sum of the two outside opportunities will be referred to as the joint outside opportunity and is given by $V \equiv U + R(\lambda)$.

Notice that the firm-worker match operates in a constant environment: outside opportunities do not change over time. As a consequence the criterion for separation will be time invariant as well. My assumptions on wage setting will be such that the optimal policy always takes the following form: separation occurs if productivity hits or falls below a reservation productivity $\underline{y}$. In this subsection I will take the reservation productivity as given, in the next subsection I will discuss who chooses it and how it is chosen.

The joint value of the match has two components. The first component is the present value of output produced until separation. For a geometric Brownian motion, current productivity provides all the information about how the process is likely to evolve in the future. Thus the present value of output depends only on current productivity y and the reservation productivity $\underline{y}$. Let $Y(y, \underline{y})$ denote this present value. An increase in current productivity increases the present value of output, both because it makes it more likely that output is high at a given point in the future and because it takes longer on average to reach the reservation productivity. A higher reservation productivity $\underline{y}$ implies earlier separation and thereby a lower present value of output.

In addition to its output the firm-worker pair receives the joint outside opportunity V upon separation. Let $Z(y, \underline{y}, V)$ be its present value. If current productivity increases

it will take longer until separation occurs, which reduces $Z\left(y, \underline{y}, V\right)$. An increase in the reservation productivity has the opposite implication.

The total joint value of the match is then given by the sum $Y\left(y, \underline{y}\right) + Z\left(y, \underline{y}, V\right)$. Now consider a match with current productivity $y > \underline{y}$ (if $y \leq \underline{y}$ separation occurs immediately, so there is no question about how the value of the match is split). Wage setting determines how the joint value of the match is divided between the firm and the worker. First I will briefly review continuous time Nash bargaining. Then I consider a different mode of wage setting in which separations are bilaterally inefficient. Finally I combine the two in order to obtain the general specification of wage determination that I will use in this paper.

Continuous Time Nash Bargaining. I assume that bargaining first takes place immediately after the firm has hired the worker. Thus the first bargain already takes into account that the outside opportunities of the firm and the worker are altered by firing costs.[16] Bargaining occurs continuously until separation. Each of the two parties

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[16]If the first bargain coincides with hiring the worker, then continuous time Nash bargaining requires that the worker makes a payment to the firm at the time of hiring. Specifically, the worker will pay the severance payment plus a fraction of the wasteful firing cost that corresponds to his share in bargaining. This "bonding" payment would imply that as far as new matches are concerned, severance payments are neutralized as discussed in Lazear (1990). Additionally, wasteful firing cost would not benefit newly hired workers (even holding the utility of the unemployed constant). Nevertheless, the analysis of this paper will still be valid as long as workers in *existing* matches experience an improvement in their bargaining position in response to an increase in firing costs. The only result that changes is that an increase in severance payments will no longer shift the productivity distribution toward lower values. Since severance payments are neutralized, they will not shift the distribution at all. Thus severance payments would have no effect on their own political support (in contrast to the negative effect in the absence of bonding).

Mortensen and Pissarides (1999b) analyze the economic effects of firing costs if such bonding takes place. In their model bonding does not take the form of a payment at the time of hiring. They deviate from continuous time Nash bargaining by assuming that the wage is only renegotiated in response to a productivity shock. As they assume a Poisson process for changes in productivity, the initial wage

must at least receive its outside opportunity. What remains of the joint value of the match after each side has been allocated its outside opportunity is referred to as the surplus of the match. It is given by

$$S\left(y, \underline{y}, V\right) \equiv Y\left(y, \underline{y}\right) + Z\left(y, \underline{y}, V\right) - V.$$

The effect of the joint outside opportunity V on the surplus will play a crucial role in shaping the preferences for employment protection. Its direct effect is to reduce the surplus one to one. However, upon separation the parties receive the joint outside opportunity, so the value of the match is increasing in V. Yet this offsetting increase in $Z\left(y, \underline{y}, V\right)$ is less than one to one due to discounting since separation occurs at some point in the future. Therefore the net effect of an increase in V on the surplus is a less than one for one reduction. More formally, the partial derivative $\frac{\partial S}{\partial V}\left(y, \underline{y}, V\right)$ lies in the interval $(-1, 0)$. Furthermore, the offsetting increase in $Z\left(y, \underline{y}, V\right)$ is small for high productivity matches since for them separation is very remote, so that an increase in the joint outside opportunity has only little effect on the joint value of the match. As a consequence the fall in the surplus is larger for matches with high productivity. More formally, the cross derivative $\frac{\partial^2 S}{\partial V \partial y}\left(y, \underline{y}, V\right)$ is negative. This discussion is summarized in the following lemma. Let $C_S = \{\left(y, \underline{y}, V\right) \in \mathbb{R}_+^3 | y > \underline{y}\}$ be the subset of the domain of S on which the match continues to operate.

Lemma 1 *The surplus S is twice continuously differentiable on C_S. For $\left(y, \underline{y}, V\right) \in C_S$ one has $\frac{\partial S}{\partial V}\left(y, \underline{y}, V\right) \in (-1, 0)$ and $\frac{\partial^2 S}{\partial V \partial y}\left(y, \underline{y}, V\right) < 0$. For $\left(y, \underline{y}, V\right) \notin C_S$ the surplus $S\left(y, \underline{y}, V\right)$ is zero.*

Proof. See Appendix B. ∎

According to continuous time Nash bargaining the worker and the firm split the surplus with shares $\beta(\lambda)$ and $1 - \beta(\lambda)$ where the share $\beta(\lambda) \in [0, 1]$ is determined by labor

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will remain in place for some time. This initial wage will be so low that in expectation the worker will make the same bonding payment as described above.

market regulation λ. Thus the utility of the worker can be written as

$$W\left(y,\underline{y},V,U,\lambda\right) \equiv U + T(\lambda) + \beta(\lambda)S\left(y,\underline{y},V\right).$$

Writing utility conditional on U and V in this particular way will prove very useful later. However, at this point it is not very intuitive. To provide more intuition I will now compute the wage implied by this sharing rule. To obtain the wage, one merely has to rewrite this sharing rule in terms of flows. As current output is y and the opportunity costs of the match are given by rV, the surplus flow is given by $y-rV$. The wage received by the worker is simply his own opportunity cost $r[U + T(\lambda)]$ plus a fraction $\beta(\lambda)$ of the flow surplus. To obtain the most intuitive expression of the wage, I will use the relationship $V = U + R(\lambda)$ to eliminate V:

$$w\left(y,U,\lambda\right) \equiv r[U + T(\lambda)] + \beta(\lambda)[y - r(U + R(\lambda))].$$

What is the partial equilibrium effect (holding constant the utility of the unemployed U) of labor market regulation on the wage? Severance payments raise the wage by improving the outside opportunity of the worker. Wasteful firing costs raise the wage by reducing the outside opportunity of the firm, which works through a reduction in the remaining scrapping value $R(\lambda)$. Finally labor market regulation enables workers to capture a larger share of the flow surplus. Notice that in all three cases labor market regulation improves the bargaining position of the worker and enables him to ask for a higher wage. According to the terminology used in the introduction, these three mechanisms are part of the appropriation effect of labor market regulation.

Bilaterally Inefficient Separations. I will introduce bilaterally inefficient separations in a simple ad hoc fashion by introducing a wedge $q(y)$ between the wage and the opportunity costs of the worker:

$$w\left(y,U,\lambda\right) \equiv r[U + T(\lambda)] + q(y).$$

I assume that the wedge $q(y)$ is strictly positive for all productivity levels $y > 0$. Two additional assumptions are made to simplify the exposition and for technical reasons.

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First, I assume that $y - q(y) \geq \varepsilon y$ where $\varepsilon > 0$, so at least some constant fraction of output is not consumed by the wedge. Second, I assume that $q'(y) < 1$, so that $y - q(y)$ is strictly increasing.[17] Apart from this the wedge is unrestricted. In particular, it need not be monotone in productivity.[18] How does labor market regulation affect the wage in this case? As before there is an appropriation effect operating through severance payments. This is the only way in which regulation affects the wage. If firing costs are entirely wasted, then even this effect is absent. But this does not mean that the worker cannot gain from wasteful firing costs. To see this, notice that the utility of the worker is now given by

$$W\left(y, \underline{y}, U, \lambda\right) = U + T(\lambda) + Q\left(y, \underline{y}\right)$$

where $Q\left(y, \underline{y}\right)$ is the present value of the wedge $q(y)$ received over the remaining duration of the job. This present value is strictly decreasing in the reservation productivity $\underline{y}$ as earlier separation shortens the time span over which the flow $q(y)$ is received. More formally, the partial derivative $\frac{\partial Q}{\partial \underline{y}}\left(y, \underline{y}\right)$ is strictly negative. Conversely, a reduction in the reservation productivity increases the present value of the wedge $Q\left(y, \underline{y}\right)$ and, everything else equal, increases the utility of the worker. But this increase in utility will be small if current productivity is high. On average it will take a high productivity match a long time to reach the reservation productivity, so the gains from a reduction in the reservation productivity are very remote. More formally, the cross derivative $\frac{\partial^2 Q}{\partial \underline{y} \partial y}\left(y, \underline{y}\right)$

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[17]As I will show in the next subsection, the firm will make the separation decision under these circumstances. The assumption that $q'(y) < 1$ insures that the optimal policy of the firm takes the form of a reservation productivity below which separation occurs. The assumption that $y - q(y) \geq \varepsilon y$ simplifies the exposition by insuring that the reservation productivity chosen by the firm is finite.

[18]It is tempting to interpret the wedge $q(y)$ as an efficiency wage payment. However, there is a reason to be somewhat cautious concerning this interpretation. In particular, the size of the efficiency wage payment a firm desires to make could be directly affect by employment protection, so one would have to write $q(y, \lambda)$. This would generate another channel through which employment protection can affect the wage. An examination of this channel is left to future work. A second interpretation is that $q(y)$ is induced by other types of labor market regulation such as policies that strengthen collective bargaining. I will comment on this interpretation in the conclusion.

is strictly positive. Let $C_Q = \{(y, \underline{y}) \in \mathbb{R}_+^2 | y > \underline{y}\}$ be the subset of the domain of Q on which the match continues to operate. The following lemma summarizes the preceding discussion.

Lemma 2 *The present value of the wedge Q is twice continuously differentiable on C_Q. For $(y, \underline{y}) \in C_Q$ one has $\frac{\partial Q}{\partial \underline{y}}(y, \underline{y}) < 0$ and $\frac{\partial^2 Q}{\partial y \partial \underline{y}}(y, \underline{y}) > 0$. For $(y, \underline{y}) \notin C_Q$ the present value $Q(y, \underline{y})$ is zero.*

Proof. See Appendix B. ∎

Given this specification of wages it is clear that the worker never wants to separate. As a consequence separation is always involuntary from the perspective of the worker. In the next subsection I will show that separations will also be bilaterally inefficient. But first I will introduce a more general specification of wage setting that nests both continuous time Nash bargaining and bilaterally inefficient separations.

Nested Specification. A simple way of nesting the two specifications of wage determination discussed above consists of two steps. First, I redefine the surplus as follows

$$S(y, \underline{y}, V) \equiv Y(y, \underline{y}) + Z(y, \underline{y}, V) - V - \varphi Q(y, \underline{y}). \tag{1}$$

The redefined surplus is what remains of the joint value of the match after each party has been allocated its outside opportunity and in addition the worker has received the present value of the wedge $\varphi Q(y, \underline{y})$. The parameter φ is either zero or one: if $\varphi = 0$ the general specification reduces to continuous time Nash bargaining; setting $\varphi = 1$ generates bilaterally inefficient separations. Subtracting $\varphi Q(y, \underline{y})$ does not change how the joint outside opportunity V affects the surplus, so Lemma 1 still applies to the redefined surplus. Second, I assume that the worker receives his outside opportunity, the present value of the wedge, plus a fraction $\beta(\lambda)$ of the redefined surplus:

$$W(y, \underline{y}, V, U, \lambda) \equiv U + T(\lambda) + \varphi Q(y, \underline{y}) + \beta(\lambda) S(y, \underline{y}, V). \tag{2}$$

To compute the wage implied by this specification, notice that the flow corresponding to the redefined surplus is given by $y - \varphi q(y) - rV$. Thus the wage is given by

$$w(y, U, \lambda) = r[U + T(\lambda)] + \varphi q(y) + \beta(\lambda)[y - \varphi q(y) - r(U + R(\lambda))],$$

where again I used the relationship $V = U + R(\lambda)$ to eliminate the joint outside opportunity V.

1.3 Labor market regulation

As discussed above, labor market regulation enters the model in two places. First, through $\gamma(\lambda)$ labor market regulation determines the size of the severance payment $T(\lambda)$ and the remaining scrapping value $R(\lambda)$. Second, labor market regulation determines the share $\beta(\lambda)$ of the surplus that the worker is able to appropriate. Notice that so far I have been silent on what the domain of λ is. Now I will be more specific. In particular, I assume that λ varies in the unit interval $[0, 1]$. I am mainly interested in two cases. In the case of *pure employment protection* only the extent of employment protection varies while the extent of surplus appropriation is fixed: $\beta(\lambda) = \bar{\beta}$ for all $\lambda \in [0, 1]$. The case of *pure surplus appropriation* is orthogonal: $\gamma(\lambda) = \bar{\gamma}$ for all $\lambda \in [0, 1]$.

However, there is no reason not to adopt a slightly more general specification. In particular I will assume that β and γ are continuous weakly increasing functions of λ: $\beta : [0, 1] \to [0, 1]$ and $\gamma : [0, 1] \to [0, 1]$. To avoid that some levels of λ are redundant, I assume that increasing λ increases the extent of at least one of the two types of labor market regulation: $\lambda^H > \lambda^L$ implies $\beta(\lambda^H) > \beta(\lambda^L)$ or $\gamma(\lambda^H) > \gamma(\lambda^L)$ for all $\lambda^H, \lambda^L \in [0, 1]$.[19]

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[19]Notice that this specification keeps the policy space one-dimensional. For the political economy analysis this implies that I do not allow a choice between employment protection and surplus appropriation. Studying the politically optimal combination of these different types of labor market regulation is left to future work.

1.4 Separation Decision

Subtracting the utility of the worker given in equation (2) from the joint value of the match yields the value of the firm:

$$J\left(y, \underline{y}, V, \lambda\right) \equiv R(\lambda) - T(\lambda) + (1 - \beta(\lambda))S\left(y, \underline{y}, V\right). \tag{3}$$

The outside opportunity of the firm is the remaining scrapping value $R(\lambda)$ minus the severance payment $T(\lambda)$. In addition the firm receives a share $(1-\beta(\lambda))$ of the (redefined) surplus.

My discussion of the separation decision will proceed in three steps. First I will describe the separation decision under the assumption that it is the firm who makes this decision. Then I will show that under Nash bargaining ($\varphi = 0$) the worker agrees with the decision of the firm, so separation is voluntary from the perspective of the worker. I will also show that separation is bilaterally efficient. Finally I will show that in the case $\varphi = 1$ the worker wants to separate later than the firm. This leads to separations that are bilaterally inefficient and involuntary from the perspective of the worker.

From equation (3) it is clear that the firm wants to maximize the surplus $S\left(y, \underline{y}, V\right)$. The following lemma describes the solution to this problem.

Lemma 3 *There is a unique reservation productivity $\underline{y}^*(V)$ that maximizes the surplus $S\left(y, \underline{y}, V\right)$ for all productivity levels $y \geq 0$. It satisfies the first order condition $\frac{\partial S}{\partial \underline{y}}(y, \underline{y}^*(V), V) = 0$ for all $y \geq 0$. The function $\underline{y}^* : \mathbb{R}_+ \to \mathbb{R}_+$ has the following properties: $\underline{y}^*(0) = 0$, $\lim_{V \to \infty} \underline{y}^*(V) = +\infty$ and $\underline{y}^{*\prime}(V) > 0$. The maximized value $S\left(y, \underline{y}^*(V), V\right)$ is increasing in productivity y.*

Proof. See Appendix B. ∎

The properties established in this Lemma are quite intuitive. In particular, the firm prefers earlier separation if the joint outside opportunity is high. Moreover, it is good to be in a high productivity match: the maximized surplus is increasing in current productivity y.

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Now consider the case of Nash bargaining ($\varphi = 0$). It follows from the definition of worker utility in equation (2) that in this case the worker also wants to maximize the surplus. Thus the worker and the firm agree on the timing of separation. Moreover, the value of the match can be written as $V + S(y, \underline{y}, V)$, so maximization of the surplus also leads to separations that are bilaterally efficient.

Next turn to the case $\varphi > 0$. Consider a match with current productivity exactly equal to the reservation productivity $\underline{y}^*(V)$ preferred by the firm. Then it is clear from equation (2) that the worker would benefit from a marginal reduction in the reservation productivity. This reduction would have no effect on the surplus because of the first order condition satisfied by $\underline{y}^*(V)$. However, it would increase the present value of the wedge Q. In other words, the reservation productivity preferred by the worker lies strictly below the reservation productivity preferred by the firm. Moreover, the value of a match is now given by $V + Q(y, \underline{y}) + S(y, \underline{y}, V)$. Thus the reservation productivity $\underline{y}^*(V)$ is also too high from the perspective of bilateral efficiency.[20] As the firm wants to separate earlier, its preferred reservation productivity will be binding. Thus $\underline{y}^*(V)$ will be the productivity level at which separation occurs both if $\varphi = 0$ and if $\varphi = 1$.

1.5   General Equilibrium Path

As discussed in subsection 1.1, the utility of the unemployed U (and thereby the joint outside opportunity V) as well as the hiring rate h are constant along the equilibrium path after the change in regulation at time $t = 0$. I will now state the conditions that determine these three constants in general equilibrium. It will be useful for this purpose to have a short notation for the surplus and the present value of the wedge for new matches, so define $\hat{S}(V) \equiv S(y_0, \underline{y}^*(V), V)$ and $\hat{Q}(V) \equiv Q(y_0, \underline{y}^*(V))$. With this

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[20]The bilaterally efficient reservation productivity will lie somewhere between the reservation levels preferred by the firm and the worker, respectively.

notation the equilibrium conditions can be written as follows:

$$0 \leq h, \tag{4}$$

$$0 \geq R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(V) - c(h), \tag{5}$$

$$0 = h\left[R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(V) - c(h)\right], \tag{6}$$

$$rU = h\left[T(\lambda) + \varphi\hat{Q}(V) + \beta(\lambda)\hat{S}(V)\right], \tag{7}$$

$$V = U + R(\lambda). \tag{8}$$

Condition (4) simply states that the hiring rate cannot be negative. The two conditions (5) and (6) are concerned with the entry decision of firms. The value of a new firm is given by the sum of its outside opportunity $R(\lambda) - T(\lambda)$ and its share in the surplus $(1 - \beta(\lambda))\hat{S}(V)$. Condition (5) states that in equilibrium the value of a new firm cannot exceed creation costs (since otherwise more firms would like to enter). According to condition (6) the value of a new firm may only fall short of creation costs in an equilibrium without entry. Condition (7) is the asset equation associated with the utility of unemployed workers. The condition states that the return rU must equal the capital gain of finding a job. The latter is given by the product of the hiring rate and the utility gain from being hired. Finally equation (8) restates the definition of the joint outside opportunity.

I will assume that y_0 is sufficiently large such that $\hat{S}(X) > 0$. (Recall that X is the scrapping value of a match.) If this condition fails, then the value of a new firm can never cover creation costs, and consequently there will never be any hiring along the equilibrium path of the economy, irrespective of the level of labor market regulation. The condition $\hat{S}(X) > 0$ rules out this uninteresting case.[21]

In the following lemma I establish that an equilibrium always exists, is unique and varies continuously with the extent of labor market regulation λ.

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[21]If $\hat{S}(X) = 0$, then $\hat{S}(R(\lambda)) \leq X - R(\lambda)$ since the surplus falls less than one to one with the joint outside opportunity. Thus the value of a new firm is less than $X - T(\lambda)$, which does not cover creation costs if hiring is positive.

Lemma 4   *(a) For each level of labor market regulation $\lambda \in [0, 1]$ the conditions (4)–(8) have a unique solution $(U(\lambda), V(\lambda), h(\lambda))$.*

   (b) The functions $U(\lambda)$, $V(\lambda)$ and $h(\lambda)$ are continuous on $[0, 1]$.

Proof. See Appendix C.   ■

Notice that the lemma is silent on how the functions $U(\lambda)$, $V(\lambda)$ and $h(\lambda)$ vary with the extent of labor market regulation λ. An answer to this question will not be needed for the political economy analysis below, so a formal analysis is omitted. However, a brief discussion is useful to provide a better understanding of how the model works.

First notice that there may exist a level of labor market regulation beyond which hiring ceases entirely, call it λ^p (and set it equal to one if no prohibitive regulation level exists). As hiring stops for $\lambda \geq \lambda^p$, the utility of the unemployed $U(\lambda)$ is zero and the joint outside opportunity is simply $V(\lambda) = R(\lambda)$.

What is the behavior of $U(\lambda)$, $V(\lambda)$ and $h(\lambda)$ for nonprohibitive levels of labor market regulation? One can show that the hiring rate is strictly decreasing in labor market regulation on the nonprohibitive range $[0, \lambda^p]$. It is easy to see why this must be the case. Suppose the hiring rate would increase in response to an increase in regulation λ. For an unchanged utility of the unemployed, a firm now receives a smaller share of the surplus, its outside opportunity is reduced and it faces increased creation costs. To maintain the willingness of firms to enter, the utility of unemployed workers must fall. But due to the increase in both labor market regulation and the hiring rate, unemployed workers are in fact better off. Thus the hiring rate can never increase in response to an increase in labor market regulation.

   One can also show that in the two cases of *pure employment protection* and *pure surplus appropriation* the joint outside opportunity $V(\lambda)$ is hump shaped on the non-prohibitive range $[0, \lambda^p]$ if a mild restriction on creation costs is satisfied.[22] This means that at low levels of regulation both the joint outside opportunity $V(\lambda)$ and the utility

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[22]The restriction is $\frac{c''(h)h}{c'(h)} > -2$. It requires that the marginal cost of creation does not decline too rapidly.

of the unemployed $U(\lambda) = V(\lambda) - R(\lambda)$ can actually be increasing in regulation.[23]

Although no precise knowledge of the functions $U(\lambda)$, $V(\lambda)$ and $h(\lambda)$ will be required, it will simplify the exposition to impose a mild assumption on the utility of unemployed workers. In particular I will assume that the utility of unemployed workers is minimized at the maximal level of regulation $\lambda = 1$. Notice that the existence of a prohibitive level of regulation is sufficient for this assumption to hold, since it implies $U(1) = 0$.

Using the function W defined in equation (2), I am now in a position to express the utility of a worker at time $t = 0$ as a function of the productivity of his match and continuing labor market regulation:

$$\mathcal{W}(y, \lambda) \equiv W(y, \underline{y}^*(V(\lambda)), V(\lambda), U(\lambda), \lambda). \tag{9}$$

1.6   Steady State

In this subsection I will determine the steady state induced by a level of labor market regulation λ_0 in three steps. First I will compute the steady state distribution of productivity across employed workers. Then I derive the steady state destruction rate and finally I calculate steady state employment.

Distribution of Productivity   In steady state a constant number of new matches H is created at each point in time. Now consider such a cohort of new matches and follow it through time. All matches start with productivity y_0 but subsequently they are subject to idiosyncratic productivity shocks. If the productivity of a match falls below the constant reservation productivity $\underline{y}$ it will separate. Thus the size of the cohort will shrink as time passes. Now revisit this cohort a periods after it has been created, in other words consider a cohort of age a. Let $\Pi(\underline{y}, a)$ be the fraction of matches that have not yet been destroyed, so $\Pi(\underline{y}, a)H$ is the total number of matches that have survived for a periods. Similarly let $\Pi(y, \underline{y}, a)H$ be the total number of matches that is left after

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[23]This result is related to the presence of congestion externalities in the Mortensen-Pissarides model and search models more generally.

a periods and exhibits current productivity below the level y.

In steady state there are cohorts of all ages, and the size of the cohort of age a is given by $\Pi(\underline{y}, a)H$. Summing over cohorts yields total employment $H \int_0^\infty \Pi(\underline{y}, a)da$. Similarly one can obtain total employment in matches with productivity less than y as $H \int_0^\infty \Pi(y, \underline{y}, a)da$. Taking the ratio of these two quantities yields the fraction of total employment in matches with productivity below y:

$$\Psi\left(y, \underline{y}\right) \equiv \frac{\int_0^\infty \Pi(y, \underline{y}, a)da}{\int_0^\infty \Pi(\underline{y}, a)da}. \tag{10}$$

Considered as a function of y this is a distribution function, and it gives the steady state distribution of productivity across employed workers. Notice that the cohort size H has cancelled, so it is not actually needed to compute the steady state distribution of productivity. The reservation productivity $\underline{y}$ is the only information that is required. In appendix B I compute the function $\Psi\left(y, \underline{y}\right)$ in closed form. In the following lemma I establish that an increase in the reservation productivity shifts the productivity distribution toward larger values.

Lemma 5 *Consider $\underline{y}^H > \underline{y}^L$. Then $\Psi(y, \underline{y}^H)$ strictly first order stochastically dominates $\Psi(y, \underline{y}^L)$, that is*

$$\Psi(y, \underline{y}^H) \leq \Psi(y, \underline{y}^L)$$

with strict inequality if both $\Psi(y, \underline{y}^L) > 0$ and $\Psi(y, \underline{y}^H) < 1$.

Proof. See Appendix B. ∎

This lemma is the last time I will make explicit use of the assumption that match-specific productivity follows a geometric Brownian motion. The theoretical results in this paper will not rely on the geometric Brownian motion as such. Only the properties established in Lemmas 1–3 and 5 will be used to obtain these results.[24]

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[24]This makes it straightforward to check whether the theoretical results of this paper carry over to other stochastic processes besides the geometric Brownian motion. One only needs to verify whether the properties stated in these lemmas hold for a specific stochastic process. The next level of generality would be to obtain these properties making only qualitative assumptions on the stochastic process of match productivity instead of checking them for specific processes. This is left to future work.

Since $\underline{y}^*(V(\lambda_0))$ is the steady state reservation productivity associated with the initial regulation level λ_0, the steady state productivity distribution as a function of initial regulation is given by

$$\Phi(y, \lambda_0) \equiv \Psi(y, \underline{y}^*(V(\lambda_0))).$$

It follows from Lemma 5 that an increase in initial regulation shifts the productivity distribution toward lower values if and only if it depresses the joint outside opportunity $V(\lambda_0)$.

Destruction Rate.   Let $L(\lambda_0)$ be steady state employment and let $d(\lambda_0)$ denote the steady state destruction rate. Together with the hiring rate $h(\lambda_0)$ they satisfy the relationship

$$d(\lambda_0)L(\lambda_0) = h(\lambda_0)(1 - L(\lambda_0)). \tag{11}$$

The left hand side is the outflow from employment. It is obtained by multiplying employment with the destruction rate. The right hand side is the flow into employment. Recall that the total mass of workers is normalized to one, so $(1 - L(\lambda_0))$ is steady state unemployment. The employment inflow is obtained by multiplying unemployment with the hiring rate.

The inflow into employment $H(\lambda_0) \equiv h(\lambda_0)(1 - L(\lambda_0))$ is also the initial size of a cohort of new matches. Then the size of a cohort of age a is given by $\Pi(a, \underline{y}^*(V(\lambda_0)))H(\lambda_0)$. Summing over cohorts yields steady state employment

$$L(\lambda_0) = h(\lambda_0)(1 - L(\lambda_0)) \int_0^\infty \Pi(a, \underline{y}^*(V(\lambda_0)))da. \tag{12}$$

Taking the ratio of the two equations (11) and (12) and solving for the destruction rate yields

$$d(\lambda_0) = \left[\int_0^\infty \Pi(a, \underline{y}^*(V(\lambda_0)))da \right]^{-1}. \tag{13}$$

An increase in $V(\lambda_0)$ raises the reservation productivity and thereby reduces the survival fractions $\Pi(a, \underline{y}^*(V(\lambda_0)))$. It follows that the destruction rate increases. Hence an increase in λ_0 will reduce the destruction rate $d(\lambda_0)$ if and only if it depresses the joint outside opportunity $V(\lambda_0)$.

Steady State Employment. From equation (11) steady state employment is given by

$$L(\lambda_0) = \frac{h(\lambda_0)}{d(\lambda_0) + h(\lambda_0)}.$$

Notice that if an increase in initial regulation depresses the joint outside opportunity $V(\lambda_0)$, then its impact on steady state employment is ambiguous: both the hiring rate and the destruction rate fall. This ambiguity is a common feature of many models of employment protection.[25]

2 The Political Setup

In the previous section the model economy experienced an unanticipated exogenous change in the labor market regime at time $t = 0$. In the remainder of the paper I assume that the new level of regulation λ is the outcome of a political decision. Now it is the opportunity to change labor market regulation that arises unanticipatedly.[26] Recall that at time $t = 0$ the economy is assumed to be in the steady state induced by the initial level of labor market regulation λ_0. The goal is to determine how the political support for continuing labor market regulation λ varies with the extent of initial regulation λ_0. Since employed workers are the principal beneficiaries of employment protection and surplus appropriation, I will primarily focus on the question how their support varies with the extent of initial regulation. I will do so by asking the hypothetical question: suppose the new level of regulation is determined in a majority vote among employed workers, how does the outcome vary with initial regulation. While the focus is on employed workers, I will examine how the results change if all workers including the unemployed participate in the vote. I will also provide an informal discussion of how initial regulation affects the political support for (or resistance against) employment protection coming

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

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

from capitalists.

2.1 Increasing Condorcet Winners

The political equilibrium concept under majority voting is that of a Condorcet winner. I will briefly review its definition. Let λ_0 be an initial level of labor market regulation. Consider two continuing levels of labor market regulation $\lambda, \lambda' \in [0,1]$ and define the utility gain of a worker in a match with productivity y if labor market regulation is changed from λ to λ':

$$\Delta(y, \lambda', \lambda) \equiv \mathcal{W}(y, \lambda') - \mathcal{W}(y, \lambda). \tag{14}$$

Let $\nu(\lambda' \succ \lambda; \lambda_0)$ be the mass of workers for which $\Delta(y, \lambda', \lambda) > 0$ under the distribution $\Phi(y, \lambda_0)$. In words, $\nu(\lambda' \succ \lambda; \lambda_0)$ is the fraction of employed workers that strictly prefer λ' over λ. Then λ' *defeats* λ *in a pairwise vote given initial regulation* λ_0 if $\nu(\lambda' \succ \lambda; \lambda_0) > \nu(\lambda \succ \lambda'; \lambda_0)$. In words, λ' defeats λ if more workers strictly prefer λ' over λ than the other way around. A regulation level $\lambda \in [0,1]$ is a *Condorcet winner given initial regulation* λ_0 if there does not exist a regulation level $\lambda' \in [0,1]$ that defeats λ in a pairwise vote. In principal there could be several Condorcet winners or there could be none. The set of Condorcet winners given initial regulation λ_0 is denoted as $\mathcal{C}(\lambda_0)$.

I would like to be able to ask the following question: is the outcome of the political decision increasing or decreasing in initial regulation? To answer this question, I need to be able to order the sets $\mathcal{C}(\lambda_0)$. The order on sets I will use for this purpose is the *strong set order*. The set $\mathcal{C}(\lambda_0)$ is *as high as* the set $\mathcal{C}(\lambda_0')$, written $\mathcal{C}(\lambda_0) \geq_S \mathcal{C}(\lambda_0')$, if for every $\lambda \in \mathcal{C}(\lambda_0)$ and $\lambda' \in \mathcal{C}(\lambda_0')$, $\lambda' > \lambda$ implies that both λ and λ' are elements of the intersection $\mathcal{C}(\lambda_0) \cap \mathcal{C}(\lambda_0')$. If the two sets are singletons consisting of λ and λ', respectively, then $\mathcal{C}(\lambda_0) \geq_S \mathcal{C}(\lambda_0')$ corresponds to $\lambda \geq \lambda'$. Thus the strong set order can be regarded as an extension of the usual order from points to sets.[27]

Using the concept of the strong set order, I can now define what I mean by saying that the political outcome is increasing or decreasing in initial regulation. Let $\Lambda_0 \subset [0,1]$

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[27]See Milgrom and Shannon (1994) for a detailed discussion of the strong set order.

be a set of initial regulation levels. Labor market regulation is said to exhibit *increasing Condorcet winners on* Λ_0 if for all λ_0^H, $\lambda_0^L \in \Lambda_0$ with $\lambda_0^H > \lambda_0^L$ the set $\mathcal{C}(\lambda_0^H)$ is as high as $\mathcal{C}(\lambda_0^L)$. Decreasing Condorcet winners are defined analogously by requiring that $\mathcal{C}(\lambda_0^L)$ is as high as $\mathcal{C}(\lambda_0^H)$.

2.2 Politically Relevant Levels of Labor Market Regulation

While the unit interval $[0,1]$ is the set of political choices, in this subsection I will show that one can restrict the search for Condorcet winners to the subset of regulation levels

$$\Lambda \equiv \{\lambda \in [0,1] | \nexists \lambda' \in [0,1] \text{ s.t. } \lambda' > \lambda \wedge U(\lambda') > U(\lambda)\}.$$

If a regulation level λ is *not* in the set Λ, then there exists a larger regulation level $\lambda' \in [0,1]$ that is strictly preferred over λ by unemployed workers. Furthermore, one can choose λ' such that it is strictly preferred over λ by almost all workers.[28] It follows that λ cannot be a Condorcet winner since it is defeated in a pairwise vote by λ'.

Lemma 6 *The set of Condorcet winners* $\mathcal{C}(\lambda_0)$ *is contained in the set of politically relevant alternatives* Λ *for all* $\lambda_0 \in [0,1]$.

Proof. See Appendix D.   ∎

This lemma is still valid if unemployed workers vote, and it will still hold if capital is given some votes as long as capitalists are in the minority.

I will view initial regulations levels as the outcome of an earlier political decision, so I will require that they are elements of Λ. Thus the set of admissible initial regulation levels is given by $\Lambda_0 \equiv \Lambda$.

2.3 Regulation and the Distribution of Productivity

In subsection 1.6 I demonstrated that an increase in initial regulation shifts the productivity distribution $\Phi(y, \lambda_0)$ towards lower values if and only if it reduces the joint outside

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[28]More precisely, for every $\epsilon > 0$ there exists $\lambda' > \lambda$ such that $\nu(\lambda' \succ \lambda; \lambda_0) > 1 - \epsilon$.

opportunity $V(\lambda_0)$. Now consider two regulation levels λ_0^H, $\lambda_0^L \in \Lambda_0$. By definition of the set Λ_0 it follows that $U(\lambda_0^H) \leq U(\lambda_0^L)$, which in turn implies $V(\lambda_0^H) \leq V(\lambda_0^L)$. If $V(\lambda_0^H) = V(\lambda_0^L)$ the distribution remains unchanged, otherwise Lemma 5 applies and the distribution shifts toward lower values in the sense of strict first order stochastic dominance. This proves the following lemma.

Lemma 7 *Consider $\lambda_0^H, \lambda_0^L \in \Lambda_0$ with $\lambda_0^H > \lambda_0^L$. Then either $\Phi(y, \lambda_0^L) = \Phi(y, \lambda_0^H)$ or $\Phi(y, \lambda_0^L)$ strictly first order stochastically dominates $\Phi(y, \lambda_0^H)$.*

Thus as far as politically relevant alternatives are concerned, an increase in regulation will indeed shift the productivity distribution toward lower values. The intuition for this result is straightforward. A politically relevant increase in labor market regulation reduces the outside opportunities of matches and separation occurs at a lower level of productivity.

3   The Structure of Preferences for Labor Market Regulation

Is the shift in the productivity distribution toward lower values a shift toward supporters or opponents of labor market regulation? In this section I will analyze how the gains from labor market regulation vary with match-specific productivity.

As discussed in the introduction, there are two channels through which workers can benefit from an increase in labor market regulation. First, the *appropriation* channel captures the gains stemming from an improvement in the bargaining position of workers. Second, if separations are bilaterally inefficient, then workers can gain from job *prolongation*. However, employed workers face a trade-off as they will be affected by the adverse general equilibrium consequences of employment protection through the *backlash* effect. In subsection 3.1 I will decompose the utility gain from an increase in regulation into these three effects. In subsection 3.2 I will examine how each of the three components

varies with match-specific productivity.

3.1 Decomposing the Gain from Higher Regulation

Consider two regulation levels λ^H, $\lambda^L \in \Lambda$ with $\lambda^H > \lambda^L$. Write $U^H \equiv U(\lambda^H)$, $V^H \equiv V(\lambda^H)$ and so forth. By the definition of the set of politically relevant alternatives it follows that $U^H \leq U^L$ and thereby $V^H \leq V^L$. This in turn implies $\underline{y}^H \leq \underline{y}^L$ (where $\underline{y}^H \equiv \underline{y}^*(V^H)$). Using equations (9) and (14) the utility gain from the increase in regulation can be written as

$$\Delta(y, \lambda^H, \lambda^L) = W\left(y, \underline{y}^H, V^H, U^H, \lambda^H\right) - W\left(y, \underline{y}^L, V^L, U^L, \lambda^L\right).$$

The first step is to separate out the direct effects of regulation and the utility of the unemployed:

$$
\begin{aligned}
\Delta(y, \lambda^H, \lambda^L) = & \left[W\left(y, \underline{y}^L, V^L, U^L, \lambda^H\right) - W\left(y, \underline{y}^L, V^L, U^L, \lambda^L\right)\right] \\
& + \left[W\left(y, \underline{y}^L, V^L, U^H, \lambda^H\right) - W\left(y, \underline{y}^L, V^L, U^L, \lambda^H\right)\right] \\
& + \left[W\left(y, \underline{y}^H, V^H, U^H, \lambda^H\right) - W\left(y, \underline{y}^L, V^L, U^H, \lambda^H\right)\right]
\end{aligned}
$$

The first component captures the direct effect of the increase in regulation from λ^L and λ^H. Using equation (2) it can be written as $[T^H - T^L] + [\beta^H - \beta^L]S\left(y, \underline{y}^L, V^L\right)$. It consists of the increase in the severance payment and the increase in the share of the surplus the worker receives. This component will be part of the appropriation effect. The second component is the direct effect of the fall in the utility of the unemployed. It is simply given by $U^H - U^L$ and will be part of the backlash effect.

The third component captures the effect of the reduction in both the joint outside opportunity and the reservation productivity. However, the drop in the reservation productivity is itself driven by the fall in the joint outside opportunity: $\underline{y}^H - \underline{y}^L = \underline{y}^*(V^H) - \underline{y}^*(V^L)$. Thus the third component can be written as

$$W\left(y, \underline{y}^H, V^H, U^H, \lambda^H\right) - W\left(y, \underline{y}^L, V^L, U^H, \lambda^H\right) = \int_{V^L}^{V^H} \frac{d}{dV} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) dv.$$

At this point I would like to extract the gain the worker experiences from job prolongation. Ideally the worker would like to be able to choose the reservation productivity directly. Here the only way to manipulate the reservation productivity is to change the joint outside opportunity through labor market regulation. However, changing the joint outside opportunity has a direct effect on utility as well. Yet the two effects are easily separated:

$$\int_{V^L}^{V^H} \frac{d}{dV} W\left(y, \underline{y}^*(v), v, U^H \lambda^H\right) dv$$
$$= \int_{V^L}^{V^H} \frac{\partial}{\partial \underline{y}} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) \underline{y}^{*\prime}(v) dv + \int_{V^L}^{V^H} \frac{\partial}{\partial V} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) dv.$$

(15)

The first component captures the utility gain induced by longer job duration. This is the *prolongation effect* and it will be denoted $\Delta_P(y, \lambda^H, \lambda^L)$.

In order to obtain the appropriation effect and the backlash effect, the second component of equation (15) must be decomposed further. Notice that the joint outside opportunity changes for two distinct reasons:

$$V^H - V^L = \left[R^H - R^L\right] + \left[U^H - U^L\right].$$

(16)

The first component is the partial equilibrium drop in the joint outside opportunity associated with an increase in wasteful firing costs. The second component is the general equilibrium fall in the utility of the unemployed.

The second component in equation (15) can be split into a general and a partial equilibrium part accordingly. Adding the partial equilibrium part to the direct effect of the increase in regulation yields the *appropriation effect*:

$$\Delta_A(y, \lambda^H, \lambda^L) \equiv \left[T^H - T^L\right] + \left[\beta^H - \beta^L\right] S\left(y, \underline{y}^L, V^L\right)$$
$$+ \int_{U^L+R^L}^{U^L+R^H} \frac{\partial}{\partial V} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) dv.$$

(17)

Adding the general equilibrium effect to the direct effect of the fall in the utility of the unemployed gives the *backlash effect*:

$$\Delta_B(y, \lambda^H, \lambda^L) \equiv \left[U^H - U^L\right] + \int_{U^L+R^H}^{U^H+R^H} \frac{\partial}{\partial V} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) dv.$$

(18)

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Notice that the decomposition of the fall in the outside opportunity in equation (16) can be used in the same way to split the prolongation effect into a partial and a general equilibrium component. Separation is delayed in partial equilibrium because an increase in wasteful firing costs makes splitting up less attractive. Separation is made even less attractive by the general equilibrium drop in the utility of the unemployed. The sum of the appropriation effect and the partial equilibrium component of the prolongation effect gives the total partial equilibrium effect of the increase in labor market regulation. In other words, the appropriation effect is simply the partial equilibrium effect purged of the utility gain achieved through job prolongation. Similarly the backlash effect is the general equilibrium effect purged of the gain due to prolongation.

In the remainder of this subsection I will use the properties established in Lemmas 1–3 to simplify the expressions for these three effects. Using equation (2), the prolongation effect can be written as

$$\Delta_P(y, \lambda^H, \lambda^L) = \varphi \int_{V^L}^{V^H} \frac{\partial}{\partial \underline{y}} Q\left(y, \underline{y}^*(v)\right) \underline{y}^{*\prime}(v) dv + \beta^H \int_{V^L}^{V^H} \frac{\partial}{\partial \underline{y}} S\left(y, \underline{y}^*(v), v\right) \underline{y}^{*\prime}(v) dv.$$

As discussed in subsection 1.4, the firm chooses the reservation productivity to maximize the surplus. The first order condition given in Lemma 3 implies that the second term of the prolongation effect is zero. Evaluating the integral for the first component, the prolongation effect can be written as

$$\Delta_P(y, \lambda^H, \lambda^L) = \varphi \left[Q\left(y, \underline{y}^H\right) - Q\left(y, \underline{y}^L\right) \right]. \tag{19}$$

The prolongation effect captures the gain the worker receives from indirectly manipulating the reservation productivity through labor market regulation. Since the firm chooses the reservation productivity to maximize the surplus, the gain from manipulation the reservation productivity comes entirely from an increase in the present value of the wedge. Consequently if there is no wedge ($\varphi = 0$), then there is no point in manipulating the reservation productivity.

The flip side of this observation is that the second component of the right hand side

in equation (15) can be written as

$$\int_{V^L}^{V^H} \frac{\partial}{\partial V} W\left(y, \underline{y}^*(v), v, U^H, \lambda^H\right) dv = \beta^H \int_{V^L}^{V^H} \frac{\partial}{\partial V} S\left(y, \underline{y}^*(v), v\right) dv$$

$$= \beta^H \left[S\left(y, \underline{y}^H, V^H\right) - S\left(y, \underline{y}^L, V^L\right)\right]. \qquad (20)$$

The first equality follows from equation (2). The second equality follows from another application of the first order condition in Lemma 3: as the change of the reservation productivity has no effect on the surplus, the entire increase in the surplus is due to the direct effect of the fall in the joint outside opportunity. I will use this result to simplify the expressions of both the appropriation and the backlash effect.

3.2   Match-Specific Productivity and the Gain from Regulation

In this subsection I will examine how each of the three effects – backlash, appropriation and prolongation – varies which match-specific productivity. I shall start with the backlash effect since it is the most straightforward.

Backlash Effect.   Using equation (20) (adapted for the change in the surplus from $U^L + R^H$ to $U^H + R^H$) to simplify equation (18), the backlash effect can be written as follows:

$$\Delta_B(y, \lambda^H, \lambda^L) = \left[U^H - U^L\right] + \beta^H \left[S\left(y, \underline{y}^H, V^H\right) - S\left(y, \underline{y}^{LH}, V^{LH}\right)\right]$$

where $V^{LH} \equiv U^L + R^H$ and $\underline{y}^{LH} \equiv \underline{y}^*(V^{LH})$. A drop in the utility of unemployed workers reduces the utility of employed workers one to one through a fall in their outside opportunity. This is the first term of the backlash effect. However, this adverse effect is mitigated by an increase in the surplus. The fall in the utility of unemployed workers reduces the joint outside opportunity. As discussed in subsection 1.2, a drop in the joint outside opportunity reduces the value of the match since the parties receive the joint outside opportunity upon separation. However, this fall in the value of the match is less than one to one, so the surplus increases. Yet the increase in the surplus will

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only be small if productivity is low: as separation is very likely, the value of a low productivity match suffers relatively more if the joint outside opportunity deteriorates. As a consequence, the offsetting increase in the surplus is larger for high productivity matches. In other words, the backlash effect is increasing in productivity.

To develop some intuition for this result, it is useful to consider two extreme cases. First, suppose that workers do not participate in the surplus at all ($\beta^H = 0$). Then all workers are hit by the backlash effect in exactly the same way. Second, suppose workers receive the entire surplus ($\beta^H = 1$). Now a worker cares about the utility of unemployed workers only to the extent that he himself is at risk of becoming unemployed. The more insulated the worker is from unemployment, the less he is exposed to the adverse consequences of labor market regulation. In the first extreme case the backlash effect does not vary with productivity while in the second extreme case it is increasing. Clearly it will be increasing in the intermediate case as well: workers in high productivity matches care less about the utility of the unemployed because they are less exposed to unemployment.

The backlash effect is illustrated in panel (a) of figure 1. Naturally it is negative for everybody. For workers that will become unemployed despite higher regulation ($y \in [0, \underline{y}^H]$) it is simply given by $U^H - U^L$. For workers in the interval $[\underline{y}^H, \underline{y}^{LH}]$ the backlash effect takes the from $U^H - U^L + S\left(y, V^H, \underline{y}^H\right)$, which is clearly increasing in productivity.[29] Finally consider workers that would remain employed even in the absence of the drop in the utility of the unemployed. A worker is a member of this group if his productivity lies in the interval $(\underline{y}^{LH}, +\infty)$. The intuition for the increasing backlash effect over this range has already been discussed. To demonstrate this result

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[29]These workers would become unemployed and have no surplus at all if the utility of the unemployed had not dropped from U^L to U^H. It may be tempting to attribute the emergence of the surplus as a consequence of job prolongation. But this is incorrect. Manipulation of the reservation productivity alone would not have been able to generate a surplus in these matches.
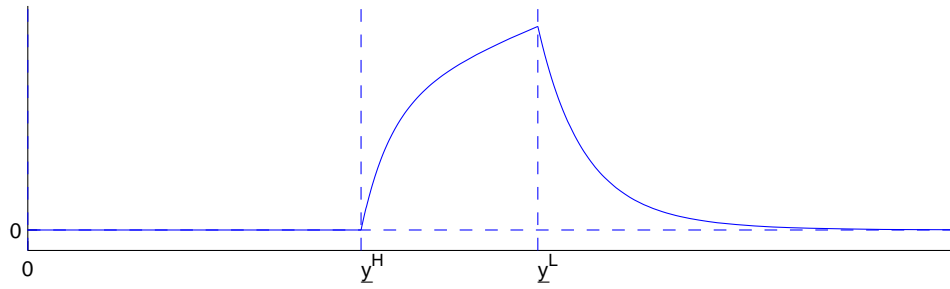
Figure 1: Decomposition of Utility Difference $\Delta(y, \lambda^H, \lambda^L)$
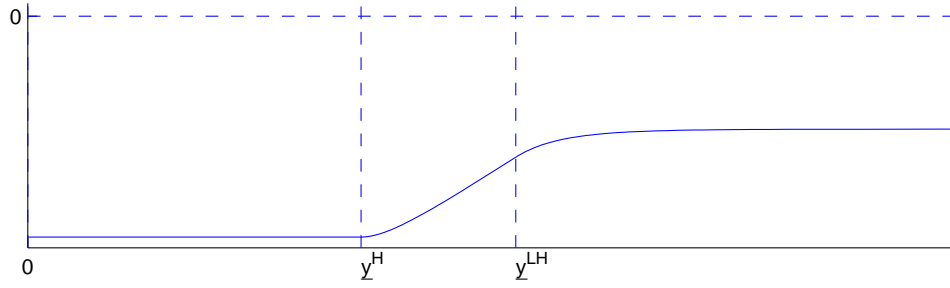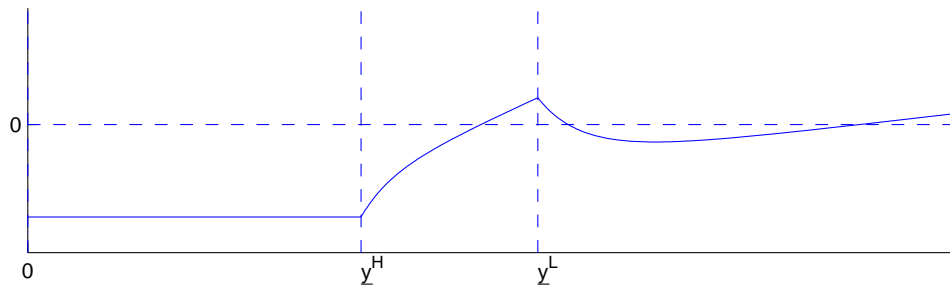

(a) Backlash Effect $\Delta_B(y, \lambda^H, \lambda^L)$
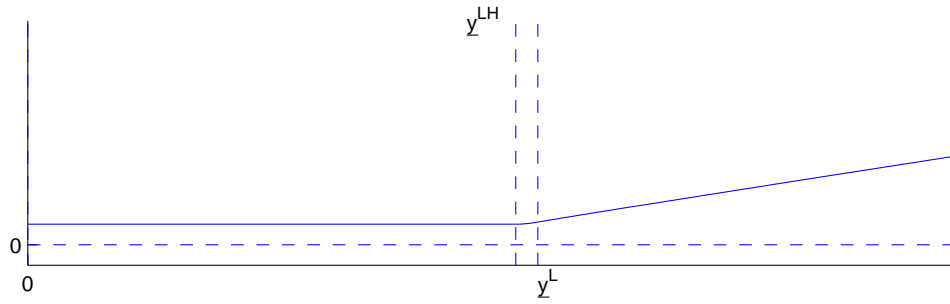
(b) Appropriation Effect $\Delta_A(y, \lambda^H, \lambda^L)$

(c) Prolongation Effect $\Delta_P(y, \lambda^H, \lambda^L)$

(d) Utility Difference $\Delta(y, \lambda^H, \lambda^L)$

formally, it is useful to once again express the change in the surplus as an integral:

$$\Delta_B(y, \lambda^H, \lambda^L) = \left[U^H - U^L\right] + \beta^H \int_{V^{LH}}^{V^H} \frac{\partial}{\partial V} S\left(y, \underline{y}^*(v), v\right) dv.$$

Differentiating with respect to productivity yields

$$\frac{\partial}{\partial y}\Delta_B(y, \lambda^H, \lambda^L) = \beta^H \int_{V^{LH}}^{V^H} \frac{\partial^2}{\partial V \partial y} S\left(y, \underline{y}^*(v), v\right) dv.$$

Recall from Lemma 1 that the cross derivative $\frac{\partial^2}{\partial V \partial y} S\left(y, v, \underline{y}^*(v)\right)$ is negative for $y > \underline{y}^*(v)$. As $V^H \leq V^{LH}$ it follows that $\frac{\partial}{\partial y}\Delta_B(y, \lambda^H, \lambda^L) \geq 0$.

Appropriation Effect. Using equation (20) (adapted for the change in the surplus from $U^L + R^L$ to $U^L + R^H$) to simplify equation (17), the appropriation effect can be written as

$$\begin{aligned}
\Delta_A(y, \lambda^H, \lambda^L) &= \left[T^H - T^L\right] + [\beta^H - \beta^L]S\left(y, \underline{y}^L, V^L\right) \\
&\quad + \beta^H \left[S\left(y, \underline{y}^{LH}, V^{LH}\right) - S\left(y, \underline{y}^L, V^L\right)\right].
\end{aligned}$$

This effect consists of three parts. The first part is the increase in the severance payment and does not vary with productivity. The second part is the additional fraction of the surplus the worker is able to appropriate, which increases in productivity along with the surplus.

The third part is the gain from an increase in wasteful firing costs. It is clear that this gain must be increasing in productivity since formally it corresponds to the second part of the backlash effect, only the reason for the fall in the joint outside opportunity differs. Intuitively, an increase in wasteful firing costs improves the bargaining position of the worker by reducing the outside opportunity of the firm. The downside is that the waste is actually realized upon separation. For high productivity matches this is not a strong concern since separation is unlikely to occur in the near future. Thus the increase in the surplus will be larger for high productivity matches.

The appropriation effect is illustrated in panel (b) of figure 1. If productivity lies in the interval $[0, \underline{y}^{LH}]$, then the worker will become unemployed despite the fall in the

joint outside opportunity from V^L to V^{LH}. Thus he only benefits from the increased severance payment. The appropriation effect for workers with productivity between $\underline{y}^{LH}$ and $\underline{y}^L$ is given by $[T^H - T^L] + \beta^H S \left(y, \underline{y}^{LH}, V^{LH} \right)$. Matches in this range have no surplus under low regulation. However, a surplus emerges as a consequence of higher wasteful firing costs. Finally over the range $(\underline{y}^L, +\infty)$ the appropriation effect is increasing both because of its second and its third part.

Prolongation Effect. Recall that the prolongation effect is given by:

$$\Delta_P(y, \lambda^H, \lambda^L) = \varphi \left[Q \left(y, \underline{y}^H \right) - Q \left(y, \underline{y}^L \right) \right].$$

As mentioned before, the reservation productivity falls both for partial equilibrium and general equilibrium reasons. But the benefit the worker derives from prolongation is conceptually the same in both cases, so there is no need for a separate discussion.

The appropriation effect is illustrated in panel (c) of figure 1. In this case it is useful to begin the discussion with high productivity matches. If productivity is in the range $[\underline{y}^L, +\infty)$, then the worker will remain employed under both low and high regulation. The increase in regulation extends the duration of the job and thereby the time over which the wedge $q(y)$ is received. In particular, the interval $(\underline{y}^H, \underline{y}^L]$ is added to the range of productivity levels over which the worker keeps his job. If productivity is high, then it is unlikely that productivity will enter the interval $(\underline{y}^H, \underline{y}^L]$ in the near future, so the gain from job prolongation is small. Conversely, if productivity is close to the separation margin under low regulation, then the worker is likely to benefit from the increase in regulation very soon. Thus workers in low productivity matches gain most from job prolongation, resulting in the downward sloping segment of the graph. To obtain this result formally, write

$$\frac{\partial}{\partial y} \Delta_P(y, \lambda^H, \lambda^L) = \varphi \int_{\underline{y}^L}^{\underline{y}^H} \frac{\partial^2 Q}{\partial y \partial \underline{y}} \left(y, \underline{y} \right) d\underline{y}.$$

Recall from Lemma 2 that the cross derivative $\frac{\partial^2 Q}{\partial y \partial \underline{y}} \left(y, \underline{y} \right) > 0$ is positive if $y > \underline{y}$. As $\underline{y}^H \leq \underline{y}^L$ it follows that $\frac{\partial}{\partial y} \Delta_P(y, \lambda^H, \lambda^L) \leq 0$.

Now consider the other end of the productivity spectrum. If productivity is below $\underline{y}^H$, then the worker will lose his job even under the high level of regulation. The drop in the reservation productivity is not large enough to allow this worker to experience an extension in job duration.

Finally suppose productivity is in the intermediate range $(\underline{y}^H, \underline{y}^L)$. Now the worker would lose his job immediately under low regulation but remains employed under high regulation, so he does experience some extension in job duration. However, if productivity is close to $\underline{y}^H$, then the reprieve granted will be rather short and the gain from job prolongation is small. Over this interval the prolongation effect can be written as $\varphi Q\left(y, \underline{y}^H\right)$. In the figure it is drawn as increasing, but this need not be the case. However, since the effect is zero at $\underline{y}^H$ and continuous, it is clear that it must be increasing over the range $(\underline{y}^H, \underline{y}^L)$ on average.

Thus one must qualify the statement that low productivity workers gain most from job prolongation: the prolongation effect is not monotone in productivity. The implications of this qualification will be discussed in detail in the next section.

4 The Ability of Labor Market Regulation to create its own Political Support

In subsection 2.3 I have shown that an increase in initial labor market regulation shifts the initial distribution of productivity toward lower values. The purpose of the previous section was to determine how match-specific productivity affects the gains from regulation. Now I will combine these results to analyze whether labor market regulation has the ability to create its own political support. Subsection 4.1 contains the main theoretical result of the paper: under the standard assumption of continuous time Nash bargaining, labor market regulation has no such ability. To the contrary, the political support for regulation today is decreasing in the extent of past regulation.

In subsection 4.2 I discuss to what extent this negative result can be overturned if

separations are bilaterally inefficient.

4.1   Continuous Time Nash Bargaining

In this subsection I set $\varphi = 0$, so the nested specification of wage determination reduces to continuous time Nash bargaining. From equation (19) it is clear that the prolongation effect is zero in this case. This is not to say that labor market regulation does not extend the duration of jobs. Yet workers do not benefit from job prolongation since separations are bilaterally efficient.

It follows that only the appropriation and the backlash effect are active. Since both are increasing in match-specific productivity, the utility difference $\Delta(y, \lambda^H, \lambda^L)$ is increasing in productivity as well. Workers in matches with high productivity like labor market regulation best, both because they are in a better position to take advantage of an enhanced bargaining position and because they are more sheltered from unemployment. It follows that the political preferences $\mathcal{W}(y, \lambda)$ satisfy the single-crossing property of Gans and Smart (1996). This property guarantees the existence of a political equilibrium. In particular, any level of labor market regulation maximizing the utility of the employed worker with median productivity is a Condorcet winner. Hence the set of Condorcet winners $\mathcal{C}(\lambda_0)$ is not empty. How does it vary with initial regulation λ_0?

An increase in initial regulation shifts the initial productivity distribution toward lower values and thereby toward workers that have little taste for regulation. This leads to the main theoretical result of this paper: the political outcome is decreasing in initial regulation, so labor market regulation is unable to generate its own political support.

Proposition 1 *Suppose wages are determined through continuous time Nash bargaining* ($\varphi = 0$). *Then labor market regulation exhibits decreasing Condorcet winners on Λ_0.*

Proof. See Appendix E.   ■

How is this result affected if unemployed workers participate in the vote? The answer

depends on how labor market regulation affects the level of employment. In particular, if initial employment $L(\lambda_0)$ is decreasing in initial regulation λ_0, then political participation of unemployed workers strengthens the conclusion of Proposition 1. Unemployed workers suffer most from labor market regulation. Thus if high regulation in the past is associated with high unemployment, this provides an additional reason why the support for labor market regulation is low today.

Furthermore, in the case of pure employment protection it is easy to see that high initial regulation is associated with stronger resistance against continuing regulation by capitalists. Firms in low productivity matches suffer most from an increase in employment protection. Thus a shift of the productivity distribution toward lower values is a shift toward firms that will resist employment protection more heavily.[30]

The case of continuous time Nash bargaining highlights that the presence of labor market rents *per se* does not make job prolongation valuable to workers, and does not enable employment protection to generate its own political support.

4.2 Bilaterally Inefficient Separations

In this subsection I allow separations to be bilaterally inefficient ($\varphi = 1$) and examine to what extent the negative result of the previous subsection can be overturned. Bilaterally inefficient separations activate the prolongation effect. I will focus on the case of pure employment protection, so regulation does not affect the share of workers in the surplus: $\beta(\lambda) = \bar{\beta}$ for all $\lambda \in [0, 1]$. Temporarily I will also assume that $\bar{\beta} = 0$, so the nested specification of wage determination reduces to the simple specification which I used to first introduce bilaterally inefficient separations in subsection 1.2. With $\bar{\beta} = 0$ the appropriation effect is still positive as long as employment protection partially takes

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[30]Using equation (3), the value of firm can be written as $\mathcal{J}(y, \lambda) \equiv R(\lambda) - T(\lambda) + (1 - \bar{\beta})S\left(y, \underline{y}^*(V(\lambda)), V(\lambda)\right)$. I consider the case of pure employment protection, so $\beta(\lambda) = \bar{\beta}$. An increase in employment protection reduces the outside opportunity of firms. This is partially offset by an increase in the surplus. However, as discussed in subsection 3.2, the increase in the surplus is relatively small for low productivity matches.

the form of severance payments. However, now the appropriation effect is constant rather than increasing in productivity. Similarly, the backlash effect is still negative but constant rather than increasing. Thus setting $\bar{\beta} = 0$ eliminates the reasons why in the preceding subsection it was workers in high productivity matches who benefited most from employment protection. This is the set of assumptions that is most favorable for overturning the negative result stated in Proposition 1. Panel (a) of figure 2 illustrates the shape of the utility difference $\Delta(y, \lambda^H, \lambda^L)$ under these assumptions. Notice that it is simply the prolongation effect $\Delta_P(y, \lambda^H, \lambda^L)$ shifted vertically by the net impact of the appropriation and backlash effect. If this net impact were positive, then all employed workers prefer the higher level of employment protection λ^H. Panel (a) shows the more interesting case in which the backlash affect outweighs the appropriation effect. Under continuous time Nash bargaining the utility difference was monotone increasing in productivity, implying the single-crossing property. The graph shows that bilaterally inefficient separations do not completely reverse this result. While the prolongation effect gives rise to a downward sloping segment of the utility difference, the single-crossing property fails to hold. Specifically, now there are two productivity levels at which workers are indifferent between the two levels of employment protection, denoted $\check{y}$ and $\hat{y}$, respectively. How does the support for λ^H vis-à-vis λ^L depend on initial employment protection λ_0? Panel (a) also depicts the location of the initial productivity distribution $\Phi(y, \lambda_0)$, setting initial employment protection equal to the lower level λ^L (vertically the distribution function is scaled to fill out the height of the graph). Starting from $\lambda_0 = \lambda^L$, a reduction in initial regulation shifts the productivity distribution toward larger values, which decreases the mass of workers that prefer the higher regulation level λ^H. Similarly, a small increase in initial employment protection will increase the number of workers that prefer λ^H. Up to now this is consistent with the ability of employment protection to generate its own political support. However, as λ_0 is increased further toward λ^H, eventually some mass of workers is shifted to the left of the lower indifference point $\check{y}$. Now it is ambiguous whether a further increase in initial employment protection induces

Figure 2: Pure employment protection with $\bar{\beta} = 0$
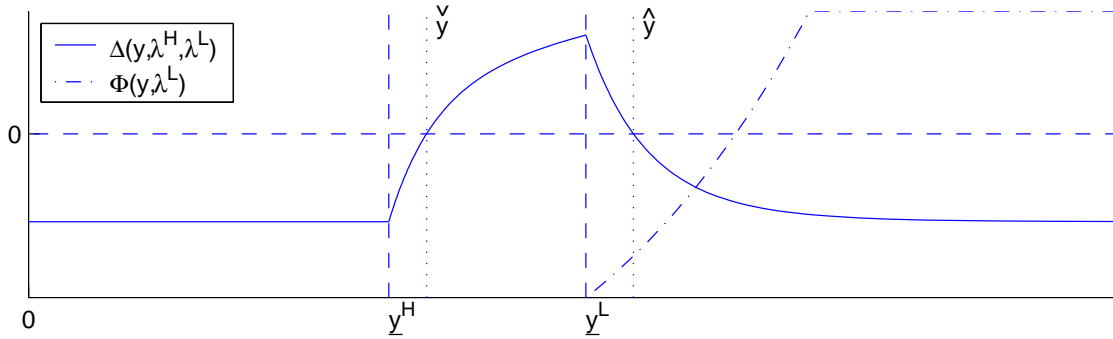
(a) Initial Regulation $\lambda_0 = \lambda^L$.
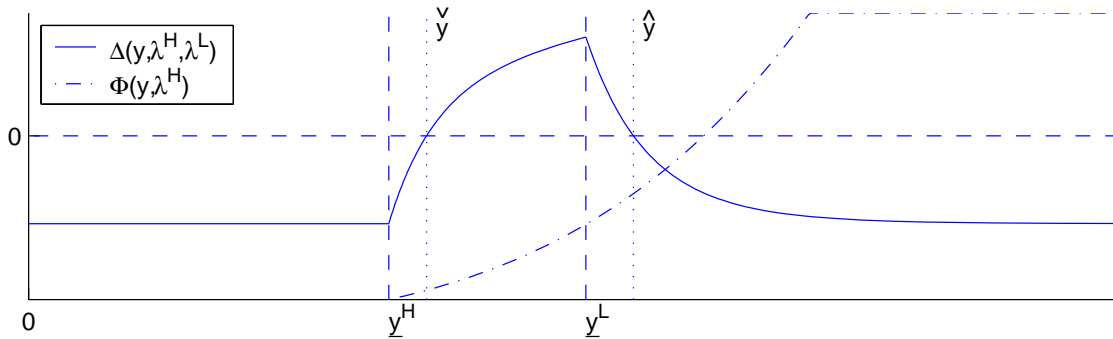
(b) Initial Regulation $\lambda_0 = \lambda^H$.

more support for λ^H.

It is instructive to look at this situation from a different angle that will reveal an asymmetry between proposals to make employment protection more stringent and proposals of deregulation. Panel (a) represents a situation in which employment protection is initially weak ($\lambda_0 = \lambda^L$) and there is a proposal to increase it to a higher level λ^H. This proposal splits employed workers in the middle: workers in low productivity matches are in favor, those in matches with high productivity oppose it. Panel (b) depicts a situation of initially strong employment protection ($\lambda_0 = \lambda^H$). However, now a proposal to reduce employment protection to a lower level λ^L gathers support not only from workers in high productivity matches. Workers in matches with very low productivity have little to lose from deregulation since they are likely to be dismissed very soon even

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Figure 3: Numerical Example

(a) $\varphi = 0$ (b) $\varphi = 1$
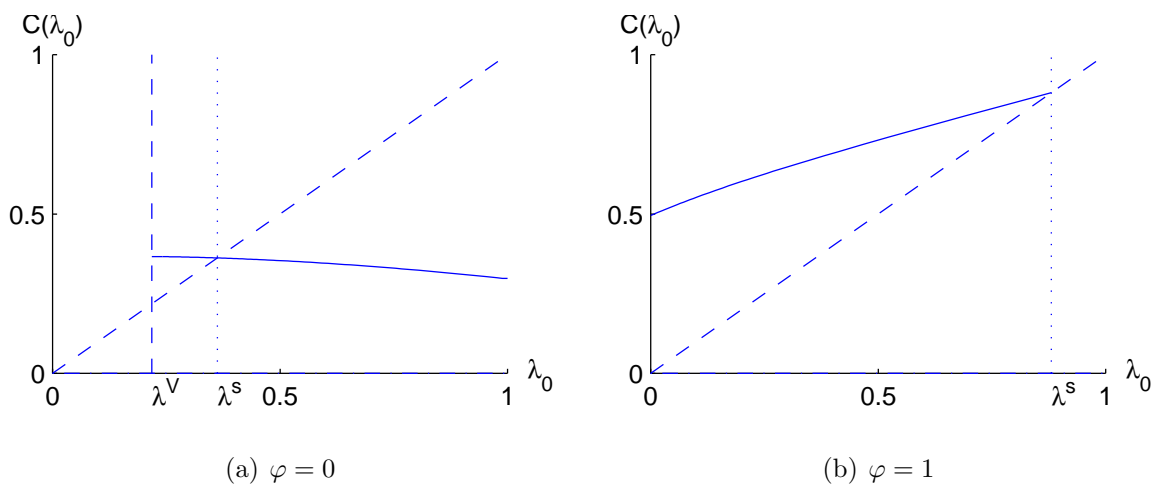
if employment protection remains stringent. To the contrary, they stand to gain a lot since deregulation will make it easier to find a new job once unemployment strikes. Thus deregulation will be supported by a coalition of workers both in matches with high and very low productivity.

According to this discussion one must qualify the statement that low productivity workers are the most ardent supporters of employment protection. In particular, there is no counterpart to Proposition 1: it is not necessarily true that Condorcet winners are everywhere increasing on the set of initial regulation levels Λ_0.

What bilaterally inefficient separations generate is the theoretical possibility that Condorcet winners are increasing in initial regulation. Figure 3 illustrates this possibility with a numerical example.[31] I continue to focus on pure employment protection but I return to the nested wage setting specification by adopting a positive value of $\bar{\beta}$. This allows me to contrast decreasing Condorcet winners under Nash bargaining with increasing Condorcet winners under bilaterally inefficient separations using a single configuration of parameters. Panel (a) depicts the case of bilaterally efficient separations

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[31]The parameters used to generate figure 3 are $r = 0.1$, $c(h) = 4 + h^4$, $X = 3.6$, $y_0 = 1.5$, $\mu = -0.01$, $\sigma = 0$, $\delta = 0.01$, $\rho = 0.6$, and $\bar{\beta} = 0.3$. The employment protection function is simply $\gamma(\lambda) = \lambda$ and the wedge is given by $q(y) = 0.2 \cdot y$.

($\varphi = 0$). One can verify that the utility of unemployed workers is hump-shaped and maximized at a positive level of employment protection λ^u. Thus $\Lambda = [\lambda^u, 1]$ is the set of politically relevant regulation levels. The graph shows the unique Condorcet winner as a function of initial regulation. According to Proposition 1 this function must be decreasing. It intersects the 45-degree line at a level of regulation denoted λ^s. This level of employment protection is a stationary political equilibrium in the following sense: if it was in place before time $t = 0$, then it will be confirmed in the vote at time $t = 0$. Panel (b) considers the same parameter configuration with one exception: separations are now bilaterally inefficient ($\varphi = 1$). The utility of the unemployed is maximized at zero regulation and decreasing throughout, so the set of politically relevant alternatives is the entire unit interval $[0, 1]$. Condorcet winners are an increasing function of initial regulation until they reach the 45-degree line. Again there is a unique stationary political equilibrium λ^s. Yet for initial regulation levels larger than λ^s, no Condorcet winner exists.[32]

Now suppose conditions are such that bilaterally inefficient separations do enable employment protection to create its own political support among employed workers. What happens if unemployed workers participate in the vote? If high initial regulation is associated with high initial unemployment, then political participation of unemployed workers reduces the ability of employment protection to generate its own support. Conversely, a positive effect of employment protection on the level of employment will enhance this ability.

From the perspective of capitalists nothing has changed. As the firm makes the

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[32]The failure of the single-crossing property in the case of bilaterally inefficient separations also gives rise to the possibility of Condorcet cycles. This is what happens to the right of λ^s. To obtain a graph which is not truncated in this way, one could consider probabilistic instead of majority voting.

Of course it is no accident that Condorcet winners cease to exist immediately to the right of the stationary equilibrium λ^s. This is precisely the point at which the issue illustrated in panel (b) of figure 2 becomes relevant: now a marginal reduction in employment protection will also be supported by a group of workers in matches with very low productivity.

separation decision there is no analog to the prolongation effect. It is still true that firms in low productivity matches suffer most from employment protection, so stringent protection in the past is associated with more resistance against employment protection today.

Thus if employment protection tends to increase unemployment, then stringent regulation in the past will give rise to a more polarized political conflict today: employed workers defend employment protection more urgently while a large number of unemployed workers and firms in low productivity matches favor deregulation.

5 Concluding Remarks

In this paper I have examined the ability of employment protection to create its own political support. I have argued that the answer depends crucially on the features of wage setting. In particular, I have shown that employment protection has no such ability in the standard Mortensen-Pissarides model with continuous time Nash bargaining. While previous research has found employment protection to have this ability if it benefits workers through longer job duration, I have shown that not rents *per se* but bilaterally inefficient separations make job duration valuable and thereby enable employment protection to create its own support. On one hand my results indicate that the circumstances under which employment protection can generate its own political support are much more narrow than suggested by the previous literature. On the other hand, by identifying these circumstances more precisely I provide a more solid foundation for future research. Finally, building on the work of Mortensen and Pissarides I have developed a theoretical framework that should prove useful in carrying out this research. I will conclude by outlining two potentially fruitful avenues of future research for which my theoretical framework is well suited.

The first avenue is to allow agents to respond in a richer fashion to the extent of employment protection. This could generate mechanisms that strengthen the ability of employment protection to generate its own political support. The basic idea is simple:

the presence of a policy induces agents to take actions in order to benefit from this policy. Once they have taken these actions, they are more likely to support the policy in the future. For example, stringent employment protection could encourage workers to undertake firm specific investments. Once workers have made such investments, they are more willing to support employment protection in the future in order to insure that they will reap the returns. The applicability of such mechanisms will once again depend on wage setting: it determines how the rents generated by specific investments are shared between the firm and the worker.

Allowing a richer response of agents can modify the effect of employment protection on its own political support in other interesting ways. Specifically, consider the response of capital. The experience of many European countries suggests that capital will respond to more stringent employment protection through withdrawal from the employment relationship: over time firms will develop technologies that rely less on the use of labor.[33] This need not diminish the political support for employment protection among employed workers. On the other hand, it makes it more likely that employment protection has adverse consequences for employment. Taking into account this response of capital, high employment protection is more likely to induce a polarization in the political conflict between labor market insiders and outsider.

A second avenue of future research starts with the realization that the extent to which separations are bilaterally inefficient is itself influenced by policies. Minimum wages and the wage compression associated with collective bargaining and strong unions reduce the ability of firms and workers to make bilaterally efficient separation decisions. Furthermore, there are reasons to believe that these types of policies and employment protection are complementary. In the absence of employment protection a firm could circumvent wage compression by dismissing workers whose productivity falls short of the wage it would be required to pay. In the absence of policies on wages, firms could circumvent employment protection by reducing wages in order to induce quits.[34] According to this

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[33]See Caballero and Hammour (1998).

[34]This argument is made informally in Bertola and Rogerson (1997).

argument, policies supporting wage compression and employment protection should be regarded as two sides of the same coin. The theoretical framework developed in this paper should be well equipped to analyze the structure of political support for this combination of policies, and more specifically, whether it has the ability to generate its own support.

A   Idiosyncratic Uncertainty

Let $y(t,s,j)$ be the productivity at time t of a match j created at time s. It is assumed assumed to follow a mixed jump-diffusion process. The diffusion component is a geometric Brownian motion while the jump component consists of a drop in productivity to zero with probability δ per unit of time. The stochastic differential associated with this process is

$$dy(t,s,j) = \mu y(t,s,j)dt + \sigma y(t,s,j)dz(t,s,j) + y(t,s,j)dq(t,s,j).$$

Here $z(t,s,j)$ is a Wiener process. The parameters $\mu \in \mathbb{R}_+$ and $\sigma \in \mathbb{R}_+$ capture drift and volatility, respectively. Finally $q(t,s,j)$ is a Poisson process with stochastic differential

$$dq(t,s,j) = \begin{cases} 0 & \text{with probability} \quad 1 - \delta dt, \\ -1 & \text{with probability} \quad \delta dt. \end{cases} \tag{21}$$

A technical assumption is needed to insure that a stationary distribution of productivity exists. It is sufficient to assume that $\delta > 0$. However, if $\delta = 0$ the drift cannot be to large, in particular it must satisfy the condition $\eta \equiv \frac{\sigma^2}{2} - \mu > 0$.

With $\delta = 0$ this process reduces to a geometric Brownian motion. With $\sigma = 0$ (which in turn requires $\mu < 0$) and $\delta > 0$ it reduces to the stochastic process considered in Saint-Paul (2002).

B   Proofs of Lemmas 1, 2, 3 and 5

Lemma 1 *The surplus S is twice continuously differentiable on C_S. For $\left(y, \underline{y}, V\right) \in C_S$ one has $\frac{\partial S}{\partial V}\left(y, \underline{y}, V\right) \in (-1, 0)$ and $\frac{\partial^2 S}{\partial V \partial y}\left(y, \underline{y}, V\right) < 0$. For $\left(y, \underline{y}, V\right) \notin C_S$ the surplus $S\left(y, \underline{y}, V\right)$ is zero.*

Proof.   Consider a flow function $g(y)$. Productivity follows a geometric Brownian motion with lower barrier $\underline{y} \geq 0$. Let $G\left(y, \underline{y}\right)$ be the present value of this flow plus the present value of a termination payoff $\bar{G}$ received upon hitting (or dropping below) the

barrier. Then $G\left(y, \underline{y}\right)$ satisfies the differential equation (see Dixit (1993), pp. 19–20)

$$(r + \delta)G\left(y, \underline{y}\right) = g(y) + \delta\bar{G} + \mu y\frac{\partial G}{\partial y}\left(y, \underline{y}\right) + \frac{1}{2}\sigma^2 y^2\frac{\partial G^2}{\partial y^2}\left(y, \underline{y}\right). \tag{22}$$

Here the discount rate is given by $r + \delta$ which reflects the fact that productivity drops to zero with Poisson arrival rate δ. Let $G_0(y)$ be the present value of the flow $g(y)$ in the absence of a lower barrier. Then the present value $G\left(y, \underline{y}\right)$ can be written as (see Dixit pp. 13–14 and p. 25)

$$G\left(y, \underline{y}\right) = G_0(y) + \frac{\delta}{r + \delta}\bar{G} + \left[\frac{r}{r + \delta}\bar{G} - G_0(\underline{y})\right]\left(\frac{\underline{y}}{y}\right)^{\xi} \tag{23}$$

where $\xi > 0$ satisfies the quadratic equation $(r + \delta) + \mu\xi - \frac{1}{2}\sigma^2\xi(1 + \xi) = 0$, that is

$$\xi = \begin{cases} \frac{\left(\mu - \frac{1}{2}\sigma^2\right) + \sqrt{\left(\mu - \frac{1}{2}\sigma^2\right)^2 + 2(r+\delta)\sigma^2}}{\sigma^2} & \text{for} \quad \sigma > 0, \\ -\frac{r+\delta}{\mu} & \text{for} \quad \sigma = 0. \end{cases}$$

First I will use these formulas to compute the present value of the joint outside opportunity received at the time of separation, that is $Z\left(y, \underline{y}, V\right)$. The flow is zero and the termination payoff is V, so

$$Z\left(y, \underline{y}, V\right) = \left[\frac{\delta}{r + \delta} + \frac{r}{r + \delta}\left(\frac{\underline{y}}{y}\right)^{\xi}\right]V.$$

Then the surplus can be written as

$$S\left(y, \underline{y}, V\right) = Y\left(y, \underline{y}\right) - \varphi Q\left(y, \underline{y}\right) - \frac{r}{r + \delta}\left[1 - \left(\frac{\underline{y}}{y}\right)^{\xi}\right]V. \tag{24}$$

It follows immediately from this formula that for $\left(y, \underline{y}, V\right) \in C_S$ both $\frac{\partial S}{\partial V}\left(y, \underline{y}, V\right) \in (-1, 0)$ and $\frac{\partial S^2}{\partial V \partial y}\left(y, \underline{y}, V\right) < 0$. ■

Lemma 2 *The present value of the wedge Q is twice continuously differentiable on C_Q. For $\left(y, \underline{y}\right) \in C_Q$ one has $\frac{\partial Q}{\partial \underline{y}}\left(y, \underline{y}\right) < 0$ and $\frac{\partial^2 Q}{\partial y \partial \underline{y}}\left(y, \underline{y}\right) > 0$. For $\left(y, \underline{y}\right) \notin C_Q$ the present value $Q\left(y, \underline{y}\right)$ is zero.*

Proof. Using equation (23) the present value $Q(y, \underline{y})$ can be written as

$$Q(y, \underline{y}) = Q_0(y) - Q_0(\underline{y}) \left(\frac{\underline{y}}{y}\right)^\xi. \tag{25}$$

It is intuitively clear that for $(y, \underline{y}) \in C_Q$ it must be the case that $\frac{\partial Q}{\partial \underline{y}}(y, \underline{y}) < 0$: earlier termination shortens the time span over which the flow $q(y)$ is received. The proof of this result is omitted. Using this result it follows that for $(y, \underline{y}) \in C_Q$

$$\frac{\partial^2 Q}{\partial \underline{y} \partial y}(y, \underline{y}) = -\frac{\xi}{y} \frac{\partial Q}{\partial \underline{y}}(y, \underline{y}) > 0.$$

$\blacksquare$

Lemma 3 *There is a unique reservation productivity $\underline{y}^*(V)$ that maximizes the surplus $S(y, \underline{y}, V)$ for all productivity levels $y \geq 0$. It satisfies the first order condition $\frac{\partial S}{\partial \underline{y}}(y, \underline{y}^*(V), V) = 0$ for all $y \geq 0$. The function $\underline{y}^* : \mathbb{R}_+ \to \mathbb{R}_+$ has the following properties: $\underline{y}^*(0) = 0$, $\lim_{V \to \infty} \underline{y}^*(V) = +\infty$ and $\underline{y}^{*\prime}(V) > 0$. The maximized value $S(y, \underline{y}^*(V), V)$ is increasing in productivity y.*

Proof. Using formula (23) and the fact that the surplus is zero at the point of termination yields

$$S(y, \underline{y}, V) = \begin{cases} S_0(y, V) - S_0(\underline{y}, V) \left(\frac{\underline{y}}{y}\right)^\xi & \text{for } y \geq \underline{y}, \\ 0 & \text{for } y \leq \underline{y}. \end{cases} \tag{26}$$

Recall that $S_0(y, V)$ is the present value of the flow $s(y) \equiv y - \varphi q(y) - rV$. It is useful to define the flow $\underline{s}(y) \equiv \varepsilon y - rV$. The assumption that $y - q(y) \geq \varepsilon y$ for some $\varepsilon > 0$ insures that $s(y) \geq \underline{s}(y)$ for all $y \geq 0$. Let $\underline{S}_0(y, V)$ be the present value of this flow. It is readily obtained in closed form:

$$\underline{S}_0(y, V) = \varepsilon \frac{y}{r + \delta - \mu} - \frac{r}{r + \delta} V.$$

As $S_0(y, V) \geq \underline{S}_0(y, V)$ and $\varepsilon > 0$ it follows that $\lim_{y \to +\infty} S_0(y, V) = +\infty$. As a final preliminary result, notice that $S_0(0, V) = -\frac{r}{r+\delta} V$ since productivity never recovers once it has dropped to zero.

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With these preparations I can now prove the lemma. First consider the case $V = 0$. Now $S_0(0, V) = 0$ and for $y > 0$ the present value $S_0(y, V)$ is strictly positive. It follows from inspection of equation (26) that $\underline{y}(V) = 0$ maximizes $S\left(y, \underline{y}, V\right)$ for all $y \geq 0$.

Next consider the case $V > 0$. Define the function $f(y) \equiv S_0(y, V)y^{\xi}$. Notice that $f(0) = 0$. Moreover, the fact that $\lim_{y \to +\infty} S_0(y, V) = +\infty$ implies that $\lim_{y \to +\infty} f(y) = +\infty$ as well. Finally, since $S_0(0, V) = -\frac{r}{r+\delta}V < 0$, it follows from continuity that there exists $y > 0$ such that $f(y) < 0$. Together these facts imply that the function f has a global minimizer on the interval $[0, +\infty)$ and that this global minimizer must be a local minimizer in the interval $(0, +\infty)$. Differentiation yields

$$f'(y) = \frac{\partial S_0}{\partial y}(y, V)y^{\xi} + S_0(y, V)\xi y^{\xi-1}.$$

Using equation (22), the second derivative can be written as

$$f''(y) = \frac{2}{\sigma^2}\left[(\xi\sigma^2 - \mu)\frac{f'(y)}{y} - s(y)y^{\xi-2}\right].$$

Now suppose y^* is a local minimizer of f on $(0, +\infty)$ (as discussed above, there must be at least one). Then $f'(y^*) = 0$ and consequently $f''(y^*) = -\frac{2}{\sigma^2}s(y^*)(y^*)^{\xi-2}$. As y^* is a local minimizer it must be the case that $s(y^*) \leq 0$. It cannot be the case $s(y^*) = 0$ since this would imply $f'''(y^*) = -\frac{2}{\sigma^2}s'(y^*) < 0$ and y^* would be a saddle point rather than a minimizer. Thus $s(y^*) < 0$. Now consider $y < y^*$. I will show that $f'(y) < 0$. Suppose to the contrary that $f'(y) \geq 0$. As f' crosses zero from below at y^*, this implies that f' must cross zero from above at some point $\tilde{y} \in [y, y^*)$, which implies $f'(\tilde{y}) = 0$ and $f''(\tilde{y}) = -\frac{2}{\sigma^2}s(\tilde{y})(\tilde{y})^{\xi-2} \geq 0$. This in turn requires $s(\tilde{y}) \geq 0$, which contradicts the fact that s is strictly increasing since $\tilde{y} < y^*$ and $s(y^*) < 0$. Next consider $y > y^*$. I will show that $f'(y) \geq 0$. Suppose to the contrary that $f'(y) < 0$. Since f' crosses zero from below at y^*, it must cross zero from above at some point $\check{y} \in (y^*, y)$. Furthermore, as $\lim_{y \to +\infty} f(y) = +\infty$ the derivative f' must return to positive values, so it has to cross zero from below at some point $\hat{y} > y$. This implies $s(\check{y}) \geq 0$ and $s(\hat{y}) \leq 0$, once again a contradiction of the fact that s is strictly increasing. Finally notice that there can be at most one $y > y^*$ such that $f'(y) = 0$, namely the productivity level that satisfies

$s(y) = 0$. Together these facts imply that the function $f(y)$ is strictly decreasing on $[0, y^*]$, strictly increasing on $[y^*, +\infty)$ and has a unique global minimum at $\underline{y}^*(V) \equiv y^*$.

Now I will use this result tho show that $\underline{y}^*(V)$ maximizes $S\left(y, \underline{y}, V\right)$ for all $y \geq 0$. First, consider the case $y > \underline{y}^*(V)$. Then $S\left(y, \underline{y}^*(V), V\right) = y^{-\xi}[f(y) - f(\underline{y}^*(V))] > 0$, so it not optimal to set $\underline{y}$ above y. Thus a maximizer must lie in the interval $[0, y]$, which implies that it must minimize f on $[0, y]$, and the unique solution to this problem is $\underline{y}^*(V)$. Second, consider the case $y \leq \underline{y}^*(V)$. Then for $\underline{y} < y$ one has $S\left(y, \underline{y}, V\right) = y^{-\xi}[f(y) - f(\underline{y})] < 0$, so it is optimal to set $\underline{y}$ above y. One such optimal choice is given by $\underline{y}^*(V)$.

The function $\underline{y}^*(V)$ satisfies the first order condition $\frac{\partial S}{\partial \underline{y}}(y, \underline{y}^*(V), V) = 0$ for all $y \geq 0$. For $y > \underline{y}^*(V)$ it also satisfies the second order condition $\frac{\partial^2 S}{\partial \underline{y}^2}(y, \underline{y}^*(V), V) < 0$. Furthermore, equation (24) implies that $\frac{\partial^2 S}{\partial \underline{y} \partial V}(y, \underline{y}^*(V), V) > 0$. Thus implicit differentiation of the first order condition yields $\underline{y}^{*\prime}(V) > 0$.

It is intuitively clear that $S\left(y, \underline{y}^*(V), V\right)$ is increasing in productivity: higher initial productivity can only increase the maximized value of the surplus. The proof of this result is omitted. ∎

Lemma 5 *Consider $\underline{y}^H > \underline{y}^L$. Then $\Psi(y, \underline{y}^H)$ strictly first order stochastically dominates $\Psi(y, \underline{y}^L)$, that is*

$$\Psi(y, \underline{y}^H) \leq \Psi(y, \underline{y}^L)$$

with strict inequality if both $\Psi(y, \underline{y}^L) > 0$ and $\Psi(y, \underline{y}^H) < 1$.

Proof. I will compute the distribution function $\Psi(y, \underline{y})$ in closed from. Let $z_0 \equiv \log(y_0)$. Let z be a Brownian motion with $z(0) = z_0$ and stochastic differential

$$dz = -\eta dt + \sigma dw$$

where w is a Wiener process and $\eta \equiv \frac{1}{2}\sigma^2 - \mu$. Let $\underline{z} \equiv \log(\underline{y})$ and define $T_z(\underline{z})$ to be the first time that $z(t)$ hits $\underline{z}$. Let q be a Poisson process with stochastic differential

$$dq = \begin{cases} 0 & \text{with probability} \quad 1 - \delta dt, \\ -1 & \text{with probability} \quad \delta dt. \end{cases} \tag{27}$$

and let T_q be the first time the event of a jump occurs. Then

$$\Pi(y, \underline{y}, a) = P(T_q > a \wedge T_z(\underline{z}) > a \wedge z(a) \leq \log(y))$$

$$= P(T_q > a) \cdot P(T_z(\underline{z}) > a \wedge z(a) \leq \log(y))$$

$$= e^{-\delta a} \left[\hat{\Pi}(z_0, a, \underline{z}, z) - \hat{\Pi}(z_0, a, z, \log(y)) \right]$$

where

$$\hat{\Pi}(z_0, a, \underline{z}, z) \equiv P(T_z(\underline{z}) \wedge z(a) > z)$$

is the probability that after a periods the Brownian motion z has not yet hit $\underline{z}$ and currently exceeds z. Notice that $\hat{\Pi}(z_0, a, \underline{z}, +\infty) = 0$, so substituting into equation (10) yields $\Psi(y, \underline{y}) = \check{\Psi}(\log(y), \log(\underline{y}))$ where

$$\check{\Psi}(z, \underline{z}) \equiv \frac{\int_0^\infty e^{-\delta a} \hat{\Pi}(z_0, a, \underline{z}, \underline{z}) da - \int_0^\infty e^{-\delta a} \hat{\Pi}(z_0, a, \underline{z}, z) da}{\int_0^\infty e^{-\delta a} \hat{\Pi}(z_0, a, \underline{z}, \underline{z}) da}$$

$$= 1 - \frac{\Gamma(z_0, \delta, \underline{z}, z)}{\Gamma(z_0, \delta, \underline{z}, \underline{z})} \tag{28}$$

and

$$\Gamma(z_0, \delta, \underline{z}, z) \equiv \int_0^\infty e^{-\delta a} \hat{\Pi}(z_0, a, \underline{z}, z) da$$

is the Laplace transform of $\hat{\Pi}(z_0, a, \underline{z}, z)$ when the latter is considered as a function of a. The next step of the proof is to compute the Laplace transform. Start with the backward equation satisfied by $\hat{\Pi}(z_0, a, \underline{z}, z)$:

$$\frac{1}{2}\sigma^2 \frac{\partial^2}{\partial z_0^2} \hat{\Pi}(z_0, a, \underline{z}, z) - \eta \frac{\partial}{\partial z_0} \hat{\Pi}(z_0, a, \underline{z}, z) = \frac{\partial}{\partial a} \hat{\Pi}(z_0, a, \underline{z}, z).$$

Transforming this equation yields the ordinary differential equation

$$\frac{1}{2}\sigma^2 \frac{\partial^2}{\partial z_0^2} \hat{\Gamma}(z_0, \delta, \underline{z}, z) - \eta \frac{\partial}{\partial z_0} \hat{\Gamma}(z_0, \delta, \underline{z}, z) = \delta \hat{\Gamma}(z_0, \delta, \underline{z}, z) - \hat{\Pi}(z_0, 0, \underline{z}, z). \tag{29}$$

At $a = 0$ all mass is concentrated at z_0, so

$$\hat{\Pi}(z_0, 0, \underline{z}, z) = \begin{cases} 0 & \text{for } z_0 \leq z, \\ 1 & \text{for } z_0 > z. \end{cases}$$

Two boundary conditions are needed. Notice that $\hat{\Pi}(\underline{z}, a, \underline{z}, z) = 0$ because absorption occurs immediately if $z_0 = \underline{z}$. This yields the first boundary condition $\Gamma(\underline{z}, \delta, \underline{z}, z) = 0$. The second boundary condition uses the fact that $\lim_{z_0 \to \infty} \hat{\Pi}(z_0, a, \underline{z}, z) = 1$ which implies $\lim_{z_0 \to \infty} \Gamma(z_0, \delta, \underline{z}, z) = \frac{1}{\delta}$.

First consider the case $\sigma > 0$. Define

$$\xi_1(\delta) \equiv \frac{\eta}{\sigma^2} + \sqrt{\frac{\eta^2}{\sigma^4} + \frac{2\delta}{\sigma^2}},$$

$$\xi_2(\delta) \equiv -\frac{\eta}{\sigma^2} + \sqrt{\frac{\eta^2}{\sigma^4} + \frac{2\delta}{\sigma^2}}.$$

Then the solution of (29) subject to the two boundary conditions is given by

$$\Gamma(z_0, \delta, \underline{z}, z) = \begin{cases} \frac{\xi_2(\delta)}{\delta} e^{\xi_1(\delta)(\underline{z}-z)} \frac{e^{\xi_1(\delta)(z_0-\underline{z})} - e^{-\xi_2(\delta)(z_0-\underline{z})}}{\xi_1(\delta)+\xi_2(\delta)} & \text{for} \quad z_0 \leq z, \\ \frac{\xi_2(\delta)}{\delta} e^{\xi_1(\delta)(\underline{z}-z)} \frac{e^{\xi_1(\delta)(z_0-\underline{z})} - e^{-\xi_2(\delta)(z_0-\underline{z})}}{\xi_1(\delta)+\xi_2(\delta)} \\ + \frac{1}{\delta}\left[1 - \frac{\xi_2(\delta)e^{\xi_1(\delta)(z_0-z)} + \xi_1(\delta)e^{-\xi_2(\delta)(z_0-z)}}{\xi_1(\delta)+\xi_2(\delta)}\right] & \text{for} \quad z_0 \geq z. \end{cases}$$

This formula is valid for $\delta > 0$. Taking the limit as $\delta \to 0$ (using L'Hospital's rule in various places) yields

$$\Gamma(z_0, 0, \underline{z}, z) = \begin{cases} \frac{\sigma^2}{2\eta^2}\left[e^{-\frac{2\eta}{\sigma^2}(z-z_0)} - e^{-\frac{2\eta}{\sigma^2}(z-\underline{z})}\right] & \text{for} \quad z_0 \leq z, \\ \frac{\sigma^2}{2\eta^2}\left[1 - e^{\frac{-2\eta}{\sigma^2}(z-\underline{z})} - \frac{2\eta}{\sigma^2}(z-z_0)\right] & \text{for} \quad z_0 \geq z. \end{cases}$$

Notice that $\Gamma(z_0, \delta, \underline{z}, \underline{z}) = \frac{1-e^{-\xi_2(\delta)(z_0-\underline{z})}}{\delta}$ for $\delta > 0$ and $\Gamma(z_0, \delta, \underline{z}, \underline{z}) = \frac{z_0-\underline{z}}{\eta}$ for $\delta = 0$. Substituting into equation (28) yields

$$\check{\Psi}(z, z_s) = \begin{cases} 1 - \frac{\xi_2(\delta)}{1-e^{-\xi_2(\delta)(z_0-\underline{z})}} e^{\xi_1(\delta)(\underline{z}-z)} \frac{e^{\xi_1(\delta)(z_0-z)} - e^{-\xi_2(\delta)(z_0-\underline{z})}}{\xi_1(\delta)+\xi_2(\delta)} \\ -\frac{1}{1-e^{-\xi_2(\delta)(z_0-\underline{z})}}\left[1 - \frac{\xi_2(\delta)e^{\xi_1(\delta)(z_0-z)} + \xi_1(\delta)e^{-\xi_2(\delta)(z_0-z)}}{\xi_1(\delta)+\xi_2(\delta)}\right] & \text{for} \quad \underline{z} \leq z \leq z_0, \\ 1 - \frac{\xi_2(\delta)}{1-e^{-\xi_2(\delta)(z_0-\underline{z})}} e^{\xi_1(\delta)(\underline{z}-z)} \frac{e^{\xi_1(\delta)(z_0-z)} - e^{-\xi_2(\delta)(z_0-\underline{z})}}{\xi_1(\delta)+\xi_2(\delta)} & \text{for} \quad z \geq z_0, \end{cases}$$

for $\delta > 0$ and

$$\check{\Psi}(z, z_s) = \begin{cases} \frac{\sigma^2}{2\eta(z_0-\underline{z})}\left[\frac{2\eta}{\sigma^2}(z-\underline{z}) - 1 + e^{-\frac{2\eta}{\sigma^2}(z-\underline{z})}\right] & \text{for} \quad \underline{z} \leq z \leq z_0, \\ \frac{\sigma^2}{2\eta(z_0-\underline{z})}\left[\frac{2\eta}{\sigma^2}(z_0-\underline{z}) - e^{-\frac{2\eta}{\sigma^2}(z-z_0)} + e^{-\frac{2\eta}{\sigma^2}(z-\underline{z})}\right] & \text{for} \quad z \geq z_0. \end{cases}$$

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Next consider the case $\sigma = 0$. Then the solution of equation (29) subject to the two boundary conditions is given by

$$\Gamma(z_0, \delta, \underline{z}, z) = \begin{cases} 0 & \text{for } z_0 \leq z, \\ \frac{1}{\delta}\left[1 - e^{-\frac{\delta}{\mu}(z - z_0)}\right] & \text{for } z_0 \geq z. \end{cases}$$

This formula is valid for $\delta > 0$. Taking the limit as $\delta \to 0$ yields

$$\Gamma(z_0, 0, \underline{z}, z) = \begin{cases} 0 & \text{for } z_0 \leq z, \\ \frac{z - z_0}{\mu} & \text{for } z_0 \geq z. \end{cases}$$

Notice that $\Gamma(z_0, \delta, \underline{z}, \underline{z}) = \frac{1}{\delta}\left[1 - e^{-\frac{\delta}{\mu}(\underline{z} - z_0)}\right]$ for $\delta > 0$ and $\frac{\underline{z} - z_0}{\mu}$ for $\delta = 0$. Substituting into equation (28) yields

$$\check{\Psi}(z, z_s) = \begin{cases} \dfrac{e^{-\frac{\delta}{\mu}(z - z_0)} - e^{-\frac{\delta}{\mu}(\underline{z} - z_0)}}{1 - e^{-\frac{\delta}{\mu}(\underline{z} - z_0)}} & \text{for } \underline{z} \leq z \leq z_0, \\ 1 & \text{for } z \geq z_0, \end{cases}$$

for $\delta > 0$ and

$$\check{\Psi}(z, z_s) = \begin{cases} \dfrac{z - \underline{z}}{z_0 - \underline{z}} & \text{for } \underline{z} \leq z \leq z_0, \\ 1 & \text{for } z \geq z_0. \end{cases}$$

Having computed the distribution function $\Psi(y, \underline{y})$ in closed form, it is straightforward but tedious to verify that $\Psi(y, \underline{y}^H)$ strictly first order stochastically dominates $\Psi(y, \underline{y}^L)$. ∎

C Proof of Lemma 4

Lemma 4 *(a) For each level of labor market regulation $\lambda \in [0, 1]$ the conditions (4)–(8) have a unique solution $(U(\lambda), V(\lambda), h(\lambda))$.*

(b) The functions $U(\lambda)$, $V(\lambda)$ and $h(\lambda)$ are continuous on $[0, 1]$.

Proof. In Lemma 3 it was shown that $\underline{y}^*$ is strictly increasing and onto $[0, +\infty)$, so $\bar{V}_0 \equiv (\underline{y}^*)^{-1}(y_0)$ is well defined and positive. By the definition of $\hat{S}$ and the properties

of S and $\underline{y}^*$ established in Lemmas 1 and 3 it follows that $\hat{S}(0) > 0$, $\hat{S}'(V) \in (-1, 0)$ for $V < \bar{V}_0$ and $\hat{S}(V) = 0$ for $V \geq \bar{V}_0$. Similarly using Lemma 2, $\hat{Q}(0) > 0$, $\hat{Q}'(V) < 0$ for $V < \bar{V}_0$ and $\hat{Q}(V) = 0$ for $V \geq \bar{V}_0$. This properties of $\hat{S}$ and $\hat{Q}$ will be used repeatedly in this proof.

First, consider the case $R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(R(\lambda)) - c_I \leq 0$. Then the triple $(U, V, h) = (0, R(\lambda), 0)$ satisfies the conditions (4)–(8). To see that this is the only solution, suppose the triple (U, V, h) satisfies the conditions (4)–(8). The right hand side of condition (7) is nonnegative, so $U \geq 0$. Suppose $h > 0$. Then

$$R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(U + R(\lambda)) - c(h)$$
$$< R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(R(\lambda)) - c_I \leq 0.$$

This violates condition (6), which requires that $R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(U + R(\lambda)) - c(h) = 0$.

Second, consider the case $R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(R(\lambda)) - c_I > 0$. Notice that can this inequality can only hold if $\hat{S}(R(\lambda)) > 0$. and it follows that $R(\lambda) < \bar{V}_0$. Now suppose the triple (U, V, h) satisfies the conditions (4)–(8). If $h = 0$ then $U = 0$ from equation (7) and consequently $V = R(\lambda)$ from equation (8). Then equation (5) reads $R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(R(\lambda)) - c_I \leq 0$, which is violated. Thus it must be the case that $h > 0$.

Now if $T(\lambda) + \varphi\hat{Q}(R(\lambda)) + \beta(\lambda)\hat{S}(R(\lambda)) = 0$, then equations (7)–(8) together imply that $U = 0$ and $V = R(\lambda)$. Then condition 6 requires that

$$R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(R(\lambda)) - c(h) = 0.$$

The left hand side is strictly positive for $h = 0$, strictly decreasing in h and approaches minus infinity as h goes to infinity. As a consequence there is a unique $h > 0$ satisfying this condition and the triple $(0, R(\lambda), h)$ obtained in this way satisfies the conditions (4)–(8).

If instead $T(\lambda) + \varphi\hat{Q}(R(\lambda)) + \beta(\lambda)\hat{S}(R(\lambda)) > 0$, then U cannot be zero since this would violate the pair of conditions (7)–(8). Then condition (7) can be rewritten as

$h = \frac{rU}{T(\lambda) + \varphi\hat{Q}(U+R(\lambda)) + \beta(\lambda)\hat{S}(U+R(\lambda))}$, and substituting into equation (6) gives the condition

$$R(\lambda) - T(\lambda) + (1 - \beta(\lambda))\hat{S}(U + R(\lambda))$$

$$- c\left(\frac{rU}{T(\lambda) + \varphi\hat{Q}(U + R(\lambda)) + \beta(\lambda)\hat{S}(U + R(\lambda))}\right) = 0.$$

The left hand side is positive for $U = 0$ and decreasing in U. As U converges to $\bar{V}_0 - R(\lambda)$ the surplus $\hat{S}(U + R(\lambda))$ goes to zero while creation costs are strictly larger than c_I and increasing. Thus the left hand side turns negative. So there is a unique $U \in \left(0, \bar{V}_0 - R(\lambda)\right)$ satisfying this condition and the triple

$$\left(U, U + R(\lambda), \frac{rU}{T(\lambda) + \varphi\hat{Q}(U + R(\lambda)) + \beta(\lambda)\hat{S}(U + R(\lambda))}\right)$$

obtained in this way satisfies the conditions (4)–(8). ∎

D   Proof of Lemma 6

Lemma 6 *The set of Condorcet winners $\mathcal{C}(\lambda_0)$ is contained in the set of politically relevant alternatives Λ for all $\lambda_0 \in [0, 1]$.*

Proof. Suppose $\lambda \notin \Lambda$. By the definition of the set Λ there exists $\underline{\lambda} > \lambda$ such that $U(\underline{\lambda}) > U(\lambda)$. The assumption that the regulation level one minimizes U together with continuity of U then implies that there exists $\bar{\lambda} > \underline{\lambda}$ such that $U(\bar{\lambda}) = U(\lambda)$. All employed workers with $y > \underline{y}^*(V(\lambda))$ strictly prefer $\bar{\lambda}$ over λ. Employed workers with $y \leq \underline{y}^*(V(\lambda))$ strictly prefer $\bar{\lambda}$ or are indifferent. Now pick $\lambda' \in [\underline{\lambda}, \bar{\lambda}]$ such that $U(\lambda') > U(\bar{\lambda})$. All workers with $y \leq \underline{y}^*(V(\lambda))$ strictly prefer λ' over λ. However, while all workers with productivity $y > \underline{y}^*(V(\lambda))$ strictly prefer $\bar{\lambda}$ over λ, it is now possible that a group of workers in matches with productivity slightly higher than $\underline{y}^*(V(\lambda))$ does not strictly prefer λ' over λ. However, this group can be made as small as desired by choosing λ' such that $U(\lambda')$ is sufficiently close to $U(\lambda)$. In other words, for every $\epsilon > 0$ there exists $\lambda' \in [\underline{\lambda}, \bar{\lambda}]$ such that $\nu(\lambda' \succ \lambda; \lambda_0) > 1 - \epsilon$. ∎

E   Proof of Proposition 1

I will prove this proposition in two steps. First I will define when an initial regulation level λ_0 provides more support for continuing regulation than an initial regulation level λ_0'. Then I prove a lemma, establishing that if λ_0 provides more support for continuing regulation than λ_0', then $\mathcal{C}(\lambda_0) \geq_S \mathcal{C}(\lambda_0')$. Finally I use this lemma to prove the proposition.

Once again consider the utility difference $\Delta(y, \lambda^H, \lambda^L)$. The initial productivity distribution $\Phi(y, \lambda_0)$ induces a distribution of this utility difference. Let $\Omega(d, \lambda^H, \lambda^L, \lambda_0)$ be the associated distribution function.

Definition 1 *Consider two initial regulation levels λ_0, $\lambda_0' \in \Lambda_0$. Then λ_0 provides more political support for continuing labor market regulation than λ_0' if $\Omega(d, \lambda^H, \lambda^L, \lambda_0)$ strictly first order stochastically dominates $\Omega(d, \lambda^H, \lambda^L, \lambda_0')$ for all λ^H, $\lambda^L \in \Lambda$ with $\lambda^H > \lambda^L$.*

Lemma 7 *Consider two initial regulation levels λ_0, $\lambda_0' \in \Lambda_0$. If λ_0 provides more political support for continuing labor market regulation that λ_0', then $\mathcal{C}(\lambda_0) \geq_S \mathcal{C}(\lambda_0')$.*

Proof. Suppose $\lambda \in \mathcal{C}(\lambda_0)$, $\lambda' \in \mathcal{C}(\lambda_0')$ and $\lambda' > \lambda$. I have to show that both λ and λ' are elements of the intersection $\mathcal{C}(\lambda_0) \cap \mathcal{C}(\lambda_0')$.

Let $\tilde{\Omega}(0, \lambda', \lambda, \lambda_0) \equiv \lim_{d\uparrow 0} \Omega(0, \lambda', \lambda, \lambda_0)$ be the lefthand limit of $\Omega(d, \lambda', \lambda, \lambda_0)$ at zero. Then the mass of workers that strictly prefers λ over λ' given initial regulation λ_0 is given by $\nu(\lambda \succ \lambda'; \lambda_0) = \tilde{\Omega}(0, \lambda', \lambda, \lambda_0)$ while $\nu(\lambda' \succ \lambda; \lambda_0) = 1 - \Omega(0, \lambda', \lambda, \lambda_0)$ is the mass of workers that strictly prefers λ' over λ.

As $\lambda \in \mathcal{C}(\lambda_0)$, it cannot be defeated by λ' given initial regulation λ_0, that is $\nu(\lambda \succ \lambda'; \lambda_0) \geq \nu(\lambda' \succ \lambda; \lambda_0)$ or

$$\tilde{\Omega}(0, \lambda', \lambda, \lambda_0) \geq 1 - \Omega(0, \lambda', \lambda, \lambda_0).$$

Analogously given initial regulation λ_0'

$$1 - \Omega(0, \lambda', \lambda, \lambda_0') \geq \tilde{\Omega}(0, \lambda', \lambda, \lambda_0').$$

Since λ_0 provides more support for continuing regulation than λ_0'

$$1 - \Omega(0, \lambda', \lambda, \lambda_0) \geq 1 - \Omega(0, \lambda', \lambda, \lambda_0')$$

with strict inequality if both $\Omega(0, \lambda', \lambda, \lambda_0') > 0$ and $\Omega(0, \lambda', \lambda, \lambda_0) < 1$. It also implies

$$\tilde{\Omega}(0, \lambda', \lambda, \lambda_0) \leq \tilde{\Omega}(0, \lambda', \lambda, \lambda_0').$$

This yields the chain of inequalities

$$\begin{aligned}
1 - \Omega(0, \lambda', \lambda, \lambda_0) &\geq 1 - \Omega(0, \lambda', \lambda, \lambda_0') \\
&\geq \tilde{\Omega}(0, \lambda', \lambda, \lambda_0') \\
&\geq \tilde{\Omega}(0, \lambda', \lambda, \lambda_0) \\
&\geq 1 - \Omega(0, \lambda', \lambda, \lambda_0).
\end{aligned}$$

If both $\Omega(0, \lambda', \lambda, \lambda_0') > 0$ and $\Omega(0, \lambda', \lambda, \lambda_0) < 1$ the first inequality is strict, yielding a contradiction. If $\Omega(0, \lambda', \lambda, \lambda_0') = 0$, then the sequence of inequalities implies $\tilde{\Omega}(0, \lambda', \lambda, \lambda_0') = 1$, another contradiction. Thus it must be the case that $\Omega(0, \lambda', \lambda, \lambda_0) = 1$. This implies that all terms in the sequence of inequalities are zero, that is all workers are indifferent between λ and λ' under both levels of initial regulation. It follows that both λ and λ' are elements of the intersection $\mathcal{C}(\lambda_0) \cap \mathcal{C}(\lambda_0')$. ∎

Proposition 1 *Suppose wages are determined through continuous time Nash bargaining ($\varphi = 0$). Then labor market regulation exhibits decreasing Condorcet winners on Λ_0.*

Proof. Consider $\lambda_0^H, \lambda_0^L \in \Lambda_0$ with $\lambda_0^H > \lambda_0^L$. I have to show that $\mathcal{C}(\lambda_0^L) \geq_S \mathcal{C}(\lambda_0^H)$. It follows from Lemma 7 that either $\Phi(y, \lambda_0^L) = \Phi(y, \lambda_0^H)$ or $\Phi(y, \lambda_0^L)$ strictly first order stochastically dominates $\Phi(y, \lambda_0^H)$. If $\Phi(y, \lambda_0^L) = \Phi(y, \lambda_0^H)$, then $\mathcal{C}(\lambda_0^L) = \mathcal{C}(\lambda_0^H)$ which implies $\mathcal{C}(\lambda_0^L) \geq_S \mathcal{C}(\lambda_0^H)$.

So suppose $\Phi(y, \lambda_0^L)$ strictly first order stochastically dominates $\Phi(y, \lambda_0^H)$. Consider $\lambda^H, \lambda^L \in \Lambda$ with $\lambda^H > \lambda^L$. The utility difference $\Delta(y, \lambda^H, \lambda^L)$ is continuous and weakly increasing in productivity y. For $d \in \mathbb{R}$ let $\bar{y}(d) \equiv \inf\{y \geq 0 | \Delta(y, \lambda_H, \lambda_L) > d\}$, setting

$\bar{y}(d) = +\infty$ if the set is empty. Then

$$\Omega(d, \lambda^H, \lambda^L, \lambda_0^H) = \Phi(\bar{y}(d), \lambda_0^H) \quad \text{and} \quad \Omega(d, \lambda^H, \lambda^L, \lambda_0^L) = \Phi(\bar{y}(d), \lambda_0^L).$$

Thus $\Omega(d, \lambda^H, \lambda^L, \lambda_0^L)$ strictly first order stochastically dominates $\Omega(d, \lambda^H, \lambda^L, \lambda_0^H)$. By definition 1 it follows that λ_0^L provides more support for continuing regulation that λ_0^H. Then Lemma 7 implies that $\mathcal{C}(\lambda_0^L) \geq_S \mathcal{C}(\lambda_0^H)$. ∎

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