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Short Job Tenures and Firing Taxes in the Search Theory of Unemployment

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Abstract
This paper studies the effects of firing taxes on the job destruction rate, when probation period - or temporary contract - policies are implemented in an otherwise exogenous job separation search model. It is shown that contrary to conventional wisdom, firing taxes can amplify the job turnover rate by providing incentives to destroy surviving matches at the end of the probation period. Moreover, low skill workers are shown to be more severely affected while wage inequality across different productivity groups may increase.

Keywords: Labor market policies, Firing taxes, Probation period, Temporary contracts, Unemployment
JEL Classifications: J64;J63;E24
Data Used: OECD Statistical Compendium and OECD Employment Outlook

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1 Introduction

It has long been argued that differences in unemployment rates and labor market performance across countries can be considered as structural and should be sought in the institutional arrangements and the diverse policy regulations employed by governments. Emphasis in the theoretical literature has been placed upon Employment Protection Legislation (EPL) and its consequences for leading labor market indicators such as job creation and job destruction. EPL consists of a set of rules that affect the process of dismissals. Hence, it is an additional cost that has to be incurred by the firm when laying off employees. Distinction in these restrictions falls in two categories: severance compensation and firing taxes. The latter is a penalty imposed by the government outside the firm-worker pair while the former is a pure transfer from the employer to the fired employee. Contract theory has established that in the presence of full wage flexibility, the two parties can effectively write contracts in such a way so as to render the effects of these transfers neutral (see Lazear, 1988 and 1990). As a result, the vast majority of the literature has focused on the concept of firing taxes[1]. This paper will move along these lines.

Firing taxes include administrative, procedural, legal and any other financial penalties that a ruling judge may impose on the firm when a separation is initiated. From a theoretical point of view, these costs are shown to suppress firing and hiring making thus the dismissal and recruitment processes smoother over the business cycle (see Mortensen and Pissarides, 2001; Bertola et al., 2000). Hence, sharp employment reductions are expected to occur less frequently in economies with stringent EPL. Empirical results are however and to some extent inconclusive.

Table 1 presents cross country comparisons for the EPL ranking of selected economies during the late 1980s and 1990s. Individual scores are first decomposed into two different contractual arrangements (temporary and regular contracts) and then an overall rating is reported. By using the job turnover rate (JTR) as a proxy for labor market flexibility, Figure 1a illustrates the relationship between EPL and JTR for 17 OECD economies in the late 1980s. It appears that a negative relationship does tend to manifest itself in the data, although it is quite surprising to observe that heavily regulated countries such as Italy, France and Sweden have the same or even higher JTR with that of the US, an economy with relaxed EPL policies (a point made also by Bertola et al., 2000). However, if JTR of continuing establishments only is taken into account, the direction of association becomes more ambiguous (see Figure 1b). On top of this, the legislation governing the Difficulty of

[1] See Garibaldi and Violante (2004) for a discussion on wage rigidity and severance compensation.

Dismissal on permanent contracts[2] - which is a major component of EPL (with a correlation coefficient of around 0.87) and is the closest in meaning to what is considered as firing taxes since it excludes legislation regarding severance compensation - is shown to be unrelated if not somewhat positively related to job turnover (see Figures 2a and 2b). It seems that the protective policies affect the dynamics of the labor market in more ways than the established ones and probably in opposite directions[3].

One possible explanation for the overall pattern is that restrictions do not usually cover workers in short tenures. Thus, stringent regulations may enlarge the pool of short term jobs - as firms attempt to circumvent termination laws - and as a result aggravate JTR. In practice, there are two sources of labor market legislation that can give rise to such short tenures: probation periods which offer an initial adjustment period for both the employer and the employee and temporary or fixed term contracts (TC). The former usually provide a firing tax-free period of a few months but can be extended for up to two years, as in the case of the UK (see Table 2, Panel A). Temporary contracts are likely to be more relevant for the purpose of this study since they involve fixed term employer-employee relations that vary from two to three years. It is important to emphasize that in these cases, notice periods and severance compensation are prohibited and workers cannot initiate procedures for unfair dismissal. That said, temporary contracts are in effect dismissal cost-free periods. Concerning duration, agreements can usually be renewed but in general they cannot exceed a certain predetermined cumulative period[4] (see Table 2, Panel B). As a result, when the contract expires the pair is either left with the option to separate or continue by writing a regular contract in which case layoff costs become operational[5].

During the mid-1980s Germany and Spain relaxed restrictions on TCs. Büchtemann (1991, 1993) and Milner et al. (1995) note that despite similar reforms in the regulation of fixed term contracts the impact was sharply different in the two countries and has taken many years to unfold. The OECD, in the Employment Outlook 1999, suggests that one candidate explanation could be identified on the basis that "*...the potential future firing costs due to EPL that were associated with hiring a worker on a permanent contract remained*

[2]The terms "regular" and "permanent" contract will be used interchangeably throughout this paper.

[3]It should be noted that one needs to be a little cautious about these conclusions because no controls have been used (controling for firm size could turn out to be important but unfortunately this is not possible in the data) and because the sample size is relatively small, excluding economies like Greece, Portugal and Spain which have notoriously stringent policies.

[4]If such a condition does arise, "*...courts can be called upon to examine the validity of the reason given and may declare the fixed term unjustified, judging that its main purpose is to circumvent termination laws*" (OECD, 1999, ch.2 p.59).

[5]It is true that in the past, temporary contracts were limited to so-called specific projects or seasonal work. However, the majority of the countries have by now either lifted or significantly relaxed these requirements. Hence, continuation on regular contract terms is straightforward if beneficial to both parties.

larger in Spain than in Germany" (OECD, 1999, ch. 2 p.71). Under such an assumption - and besides adversely affecting JTR - such policies will also influence the composition of employment regarding permanency on the job.

Keeping in mind the well known limitations dictated by the nature and availability of information of EPL indicators[6], Table 3 summarizes the estimation results of regressing the share of temporary employment on the measures of employment protection of 24 OECD countries for the late 1990s. The first two columns refer to a simple univariate regression while the last two include additional variables to control for country specific effects. The number of additional variables however, ought to be kept to a minimum given the limited number of observations available. In the estimations both indicators of EPL in regular contracts were used. The dependent variable (TE) is the average of temporary employment shares between 1998 and 2002 while the policy indicators refer to the late 1990s[7]. This was done to avoid any potential endogeneity problems and because changes in policy may require time until their effects become evident. Not surprisingly, the sign of the estimated coefficients in the univariate regressions is within the lines of the previous discussion, their magnitude is quite considerable and they are statistically significant at conventional levels. Regarding the multivariate regressions, the unemployment rate (UR) is included because higher unemployment rate might make agents more willing to commit themselves to temporary contractual agreements[8] and the labor productivity growth ($LPGR$) is added on the basis that higher rate of growth may induce more investment in human capital and thus encourage longer employer-employee relationships. Finally, GDP growth ($GDPGR$) is included as a standard control variable. The estimation documents that legislation is a significant determinant of temporary employment. The estimated coefficients are marginally lower than before and they are still statistically significant at better than 5 percent [9] (this result is consistent with the findings of Grubb and Wells, 1993). Overall, the regulation governing dismissals in permanent contracts seems to matter for the composition of employment. For this reason, one needs a theoretical grounding of how this mechanism depends on policy design and how it affects the equilibrium. To do so, such policies must be explicitly modeled[10].

[6] See Bertola et al. (2000) for an extended discussion on the issue.

[7] Estimations were also performed by averaging the variables over 1996-2002 but with no noticable changes in the results.

[8] There may be an endogeneity issue here, but this will not affect estimates for employment protection.

[9] Additional variables were also included in the regression but without any changes in the results. Examples include union density, subsidies to regular employment as well as the EPL indicators for temporary employment.

[10] Although not exactly the same in reality, I will use the terms “probation period” and “temporary contract (TC)” interchangably for the needs of this paper.

To incorporate regulations of this kind in a search model of unemployment, one does not need necessarily to resort to a model of endogenous job destruction. Indeed, I will use the simplest framework possible to raise the issue by building on a model of exogenous job separation. Of course, under such an assumption, the link between termination taxes and employment protection is broken[11]. This needs not be of serious concern however. The purpose of this paper is to identify these conditions under which firing restrictions can amplify the separation rate and not to re-establish the fact that layoff costs smooth destruction rates. All in all, I make no attempt to justify why dismissal taxes are in place. Yet, I use such an assumption as given and study its consequences for wages, unemployment rate and job destruction.

Overall, the study raises the issue of the complexity of such policies and makes an effort to fill in a potential gap in the literature. Moreover, it advocates that some of the observed phenomena concerning turnover rates as well as the composition of employment regarding permanency on the job could, at least partially and in principle be addressed within the discussed mechanism.

The next section describes the structure of the model· it starts with an overview of the notation and assumptions and then discusses the two alternative environments upon which, the model will be built. Section 3 explains the possible equilibria outcomes and studies the relationship between firing taxes, job destruction and unemployment rate. Section 4 illustrates the effects of such policies on different productivity groups and wage differentials while section 5 proceeds with some computational experiments. Section 6 concludes the paper.

2 The model

2.1 Notation and assumptions

The model put forward is a standard search and matching model of exogenous job destruction pioneered by Mortensen (1978) and Pissarides (1984, 1985 and 2000). One usual assumption is that each firm employs one worker. Firms without workers post vacancies at a cost of pc, where p is the job's productivity. The vacancy cost is proportional to productivity under the assumption that it is more costly to acquire more productive workers. It is also sunk and thus the investment undertaken by the firm is irreversible. In equilibrium, job creation is governed by profit maximization by taking into account expected revenue and cost

[11] Although and as it will become clear later in the paper, such policies can be justified on the grounds of reducing wage inequality.

of a newly created match. The matching function $m(v, u)$ which directs employer-employee meetings is assumed to be increasing in both arguments, concave and homogeneous of degree one in vacancies (v) and unemployment (u)[12].

All realized job matches yield a pure economic rent. If the worker and the firm separate, each party will have to go through a costly search process in order to meet its next partner. It is this rent that has to be shared in the wage contract. Here, I assume that this surplus is divided in fixed proportions between the firm and the worker, in a bargaining process where β represents labor's share.

Negative shocks arrive to existing matches at the Poisson rate δ. When this happens the productivity of the job is reduced to zero and hence the match dissolves. However, the latter may not be the only source of job destruction. After the worker and the firm match, the job enters a probation time period T whose length is determined by policy. During this time, employers can costlessly fire existing workers. If the match survives and this period elapses, the firm becomes liable to a firing tax pF, again imposed by policy. Therefore, the implementation of a firing restriction that becomes operational after a predetermined period of time introduces a process of endogenous separation decisions since firms may find it optimal to destroy the match instead of becoming liable to the termination tax in the future.

To simplify what follows and without loss of generality, assume that the date of job creation is always denoted as $\tau = 0$. The remaining of the notation that will be used is: V the value of a vacant job (irrespective of time), J the value of an active job at date of creation, $J(t)$ the value of an active job at t (created at $\tau = 0$), W the value of employment at date of creation, $W(t)$ the value of employment at t (created at $\tau = 0$), U the value of unemployment (irrespective of time), z the unemployment income and r the interest rate.

2.2 Firms dismiss workers at T

I begin by examining the equilibrium when firms find it beneficial to dispose off the match at the end of T. Given a matching function $m(v, u)$ the probability that a worker will arrive to a vacant job is equal to $m(v, u)/v$ while the probability that an unemployed agent will find an unoccupied working opportunity is $m(v, u)/u$. Using the homogeneity of the matching function, one can rewrite the latter two as functions of the ratio of vacancies to unemployment. Let θ be equal to v/u and refer to it as the market tightness. Therefore, the rate at which vacant jobs become filled is denoted by $q(\theta) \equiv m(\theta, 1)$ and the rate at which unemployed agents move into employment is $\theta q(\theta) \equiv \theta m(\theta, 1)$.

[12] Empirically, studies establish the existence of an aggregate matching function with constant returns to scale. See Divine and Kiefer (1991) and Petrongolo and Pissarides (2001) for a survey of the issue.

The asset pricing equation for the return of a vacant job is given by:

$$rV^1 = -pc + q(\theta)\left[J^1 - V^1\right] \tag{1}$$

A vacant job costs pc per unit of time and changes state at a rate $q(\theta)$. When job creation takes place, it yields a net return of $J^1 - V^1$. Free entry implies that $V^1 = 0$ and thus:

$$J^1 = \frac{pc}{q(\theta)} \tag{2}$$

Eqn.(2) will be referred to as the job creation condition. It states that in equilibrium firms will create vacant jobs to the point where the value of a newly created match equals the expected cost of maintaining a vacancy.

Following similar reasoning:

$$rJ^1(t) = p - w_1(t) - \delta J^1(t) + \dot{J^1}(t) \tag{3}$$

where $w_1(t)$ is the wage rate in regime 1, $t \in [0, T]$ and $\lim_{t\to T} \dot{J^1}(t) = 0$. Note that in regime 1, firms never pay the firing tax since they always dismiss employees at the end of T. Finally, the job loses value as time progresses because it approaches the end of its life-cycle.

The values of employment and unemployment satisfy the following asset pricing equations respectively:

$$rW^1(t) = w_1(t) - \delta\left[W^1(t) - U^1\right] + \dot{W^1}(t) \tag{4}$$

$$rU^1 = z + \theta q(\theta)\left[W^1 - U^1\right] \tag{5}$$

The capital value of employment is equal to its net return $w_1(t)$ minus the risk of changing state to unemployment and the capital value of unemployment is equal to unemployment income adjusted for the possibility that the agent will become employed. z may refer to a state provided benefit or imputed income from leisure or a combination of the two. I will discuss later the implications of such assumptions when I study productivity differences.

2.2.1 Wage determination

When the worker and the firm meet they share the surplus match value in fixed proportions. Thus the wage is set to maximize the Nash product $(J^1 - V^1)^{1-\beta}(W^1 - U^1)^{\beta}$. By assuming that the same bargaining holds for all future renegotiations, one obtains:

$$w_1 = (1-\beta)z + \beta p(1 + c\theta) \tag{6}$$

(see Appendix A for an explicit derivation of w_1).

The wage is constant in t since both, employer and employee, make capital losses as $t \to T$. These loses must be shared according to the Nash bargaining rule.

2.2.2 Job value

Given the wage and an exogenously probation period set by policy, the optimal value of a job in regime 1 at any $t \in [0, T]$ is given by:

$$J^1(t) = \int_t^T [p - w_1(\theta)] e^{-(r+\delta)(s-t)} ds \tag{7}$$

By setting $t = 0$ one obtains:

$$J^1 = \int_0^T [p - w_1(\theta)] e^{-(r+\delta)s} ds \tag{8}$$

or, because both p and w_1 are independent of time:

$$(r+\delta) J^1 = [p - w_1(\theta)][1 - e^{-(r+\delta)T}] \tag{9}$$

Clearly, J^1 converges to 0 as $T \to 0$ and to $[p - w_1(\theta)]/(r+\delta)$ as $T \to +\infty$.

2.2.3 Equilibrium in regime 1

A solution to the model of regime 1 consists of a job value and a market tightness pair (J^{1*}, θ^*) that solves eqns.(2) and (9). Since the former is an upward sloping curve in the (J, θ) space while the latter is a downward sloping one, existence of unique equilibrium is guaranteed. Equilibrium market tightness is then determined by:

$$[p - (1-\beta)z - \beta p(1 + c\theta^*)] [1 - e^{-(r+\delta)T}] - (r+\delta)\frac{pc}{q(\theta^*)} = 0 \tag{10}$$

Inspection of eqn.(10) easily establishes that the l.h.s. is decreasing in θ^* and increasing in T implying that equilibrium market tightness increases monotonically in the probation period. The intuition for this is simple: an increase in T makes the expected life of a job longer. As a result the job value curve shifts upwards determining higher market tightness, higher job value and higher wage. Since both, the equilibrium job value and equilibrium market tightness are monotonically increasing in T it immediately follows that J^{1^*}, θ^* and w_1^* are always less than their respective values in a policy-free equilibrium.

2.3 Regime 2: Firms do not destroy surviving matches at T

In regime 2 all firms chose not to dismiss workers in surviving matches at the end of the fixed horizon. Alternatively, a TC is transformed to a permanent contract with probability one, conditional on that the match has survived to T.

As before, the asset pricing equation for a new vacancy is given by:

$$rV^2 = -pc + q(\theta)\left[J^2 - V^2\right] \tag{11}$$

where again profit maximization implies:

$$J^2 = \frac{pc}{q(\theta)} \tag{12}$$

Consider now the job value for any $t \in [0, T]$:

$$J^2(t) = \int_t^T [p - w_2(s)]e^{-(r+\delta)(s-t)}ds + \int_T^\infty [p - w_2(s) - \delta pF]e^{-(r+\delta)(s-t)}ds \tag{13}$$

and by setting $t = 0$

$$J^2 = \int_0^T [p - w_2(s)]e^{-(r+\delta)s}ds + \int_T^\infty [p - w_2(s) - \delta pF]e^{-(r+\delta)s}ds \tag{14}$$

The value of a job equals its net return $p - w_2(t)$. The job also runs a risk of being destroyed which will result in the loss of J^2. If the match survives to T, the firm is locked in and will incur a firing tax pF with probability δ at each $t > T$.

The dismissal payment is assumed to be proportional to productivity on the grounds that it is more costly to get rid off a more productive worker than a less productive one. Of course, after TC is terminated, the asset pricing equation becomes:

$$(r + \delta)J^{2T} = p - w_2 - \delta pF \tag{15}$$

Finally, the equations for the values of employment and unemployment respectively, are:

$$W^2(t) = \int_t^T [w_2(s) + \delta U^2]e^{-(r+\delta)(s-t)}ds + \int_T^\infty [w_2(s) + \delta U^2]e^{-(r+\delta)(s-t)}ds \tag{16}$$

$$rU^2 = z + \theta q(\theta)\left[W^2 - U^2\right] \tag{17}$$

2.3.1 Wage determination

As before, the wage is set to split the surplus match value in fixed proportions. Consider now a firm at the date of job creation (or at any $t \in [0, T]$). If it separates from the employee its loss will be $J^2(t)$. On the other hand, if destruction takes place after T, its loss will be $J^{2T} + pF$. This difference suggests the presence of a two-tier wage: an initial wage until T and a second one from T and on.

The initial wage is given by:

$$w_2 = (1 - \beta)z + \beta p(1 + c\theta) \tag{18}$$

while the second one is:

$$w_{2T} = (1 - \beta)z + \beta p(1 + c\theta) + \beta rpF \tag{19}$$

(see Appendix A for a formal derivation).

w_{2T} - the "insider" wage - is shown to be higher than the "outsider" one (w_2). This is because of the fact that after T has elapsed the firm is locked in and as a result the "continuation" wage increases in the firing tax.

Some authors reject the plausibility of a two-tier wage (see Lindbeck and Snower, 1988) by arguing that the worker has no credible threat to force renegotiation. In any case, this issue has to be challenged on empirical grounds although its implications would affect the predictions of the model quantitatively but not qualitatively. It has to be noted however that Friesen (1996) who studied the wages of workers subject to different regulations from different Canadian provinces, found that after controlling for education, firm size, occupation and industry, incumbent workers protected from legislation appeared to extract higher wages than workers not protected by law and that starting wages tended to fall to offset subsequent increases.

2.3.2 Equilibrium in regime 2

A solution to the model of regime 2 consists of a job value and a market tightness pair (J^{2^*}, θ^{**}) that solves eqns.(12) and (14) by first substituting out the wages in eqn.(14). For the same reason as before, existence of unique equilibrium is guaranteed. Equilibrium market tightness is now determined by:

$$[p - (1 - \beta)z - \beta p(1 + c\theta^{**})] - e^{-(r+\delta)T} pF(\beta r + \delta) - (r + \delta)\frac{pc}{q(\theta^{**})} = 0 \tag{20}$$

Clearly, equilibrium θ is again shown to be increasing in T.

3 Equilibrium

Given the two alternatives, the equilibrium can be identified by establishing the conditions under which the strategy of an individual firm i is optimal given the strategy chosen by the rest of the firms in the economy[13]. In other words, one seeks to find a range of F for which given that all firms, except firm i, dismiss workers in surviving matches at T, dismissal at T corresponds to the optimal response of firm i as well and a range of F for which given that all firms, except firm i, do not dismiss workers in surviving matches at T, not dismissal at T corresponds to the optimal response of firm i as well.

Proposition 1 *Let θ^* be the equilibrium market tightness in regime 1. Then for any finite T, there exists an F^* where:*

$$F^* = \frac{[p - (1-\beta)\, z - \beta p\, (1 + c\theta^*)]}{p(\beta r + \delta)} \tag{21}$$

such that:

(a) For $F > F^*$ there exists a unique Nash equilibrium in which all firms dismiss workers in surviving matches at T.

(b) For $F = F^*$ there is no unique equilibrium and some dismissal may take place at T.

Proof. *See Appendix B* ■

Proposition 2 *Let θ^{**} be the equilibrium market tightness in regime 2. Then for any finite T, there exists an F^{**} where:*

$$F^{**} = \frac{[p - (1-\beta)\, z - \beta p\, (1 + c\theta^{**})]}{p(\beta r + \delta)} \tag{22}$$

such that:

(a) For $F < F^{**}$ there exists a unique Nash equilibrium in which all firms do not dismiss workers in surviving matches at T.

(b) For $F = F^{**}$ there is no unique equilibrium and some dismissal may take place at T.

[13] Implicit in this formulation is the assumption that firm i is too small to affect market tightness.

Proof. *See Appendix B* ■

Proposition 3 *Let θ^* and θ^{**} be the equilibrium values of market tightness in regime 1 and 2 respectively. Then for $F = F^{**}$:*

$$F^* = F^{**} \text{ always} \tag{23}$$

Proof. *See Appendix B* ■

Given Propositions 1, 2 and 3, Corollary 1 follows:

Corollary 1 *For any increasing, concave and homogeneous of degree one matching function and for any finite T, there exists an $\widetilde{F}$ such that:*

$$\widetilde{F} = \frac{[p - (1-\beta)\,z - \beta p\,(1 + c\theta^*)]}{p(\beta r + \delta)} \tag{24}$$

and:

(a) For all $F > \widetilde{F}$ all firms chose to destroy surviving matches at T

(b) For all $F < \widetilde{F}$ all firms chose not to destroy surviving matches at T

(c) For $F = \widetilde{F}$ there is a multiplicity of equilibria in which some dismissal may take place at T.

Corollary 1 suggests that implementing a probation period regulation (or facilitating the use of TCs) may result in jobs being destroyed not only due to the arrival of an adverse shock but also as the outcome of endogenous separation decisions at T. As a result, such a policy may adversely affect the job turnover rate because of the most frequent firing taking place.

3.1 Equilibrium unemployment

In this section I discuss the implications for equilibrium unemployment. There are two cases to consider: when $T = 0$ in which case the model collapses to the Pissarides version (2000, ch. 9) and when T is non-zero and finite[14].

[14]Clearly, I abstract from the possibility of $T \to +\infty$ since trivially this implies that there are in effect no firing restrictions.

When $T = 0$ there is no equilibrium in regime 1 because in any meaningful equilibrium the job value must be strictly positive. Therefore, by equating job creation to job destruction, steady state equilibrium unemployment is given by:

$$u^{**0} = \frac{\delta}{\delta + \theta^{**0} q\left(\theta^{**0}\right)} \tag{25}$$

(where the superscripts indicate that $T = 0$). Since θ^{**} is increasing in the probation period and u is decreasing in θ[15], u^{**0} is unambiguously higher than its respective value in a policy-free environment.

If T is non-zero and finite one needs to consider whether $F < \widetilde{F}$, $F > \widetilde{F}$ or $F = \widetilde{F}$.

Under the assumption that $F < \widetilde{F}$, equilibrium unemployment rate is again given by eqn.(25) where now the equilibrium value of market tightness is higher, implying a lower value for unemployment.

When $F > \widetilde{F}$ and with an exogenous arrival rate of the adverse shock drawn from a Poisson distribution, the fraction of newly created jobs that survive to T is given by $e^{-\delta T}$ and therefore job destruction is now determined by:

$$JD^T = \delta(1 - u^T) + JC^T e^{-\delta T} \tag{26}$$

(where again the superscript T indicates the finite probation horizon). Hence, equilibrium unemployment rate is given by:

$$u^{*T} = \frac{\delta}{\delta + \theta^{*T} q(\theta^{*T})\left(1 - e^{-\delta T}\right)} \tag{27}$$

Comparison with eqn.(25) reveals that it is not necessary for unemployment to be higher when $T = 0$. More specifically, if:

$$\theta^{*T} q(\theta^{*T})\left(1 - e^{-\delta T}\right) < \theta^{**0} q\left(\theta^{**0}\right) \tag{28}$$

then u^{*T} will be higher than u^{**0}. In other words, the introduction of a trial period (or TC) which seems to "alleviate" the policy restrictions, may actually amplify the unemployment rate by enabling employers to destroy surviving matches at the end of T. The latter is more likely to be true when T is relatively small and as a result the more frequent job destruction will cause unemployment to rise.

Finally when $F = \widetilde{F}$ there is a multiplicity of equilibria and some dismissal may take

[15]Implicit to this, is the assumption that the direct effect of θ on u more than offsets the indirect effect through $q(\theta)$.

place. The equilibrium cannot be predicted ex ante but the possible outcomes can be Pareto ranked, at least in terms of unemployment. To see this consider what happens when $F = \widetilde{F}$: equilibrium market tightness is the same in both regimes. Therefore, $u^T(\theta^{*T})$ is unambiguously higher than $u^T(\theta^{**T})$ because of the dismissal occurring at T. All other cases are clearly worse off than $u^T(\theta^{**T})$ since some destruction takes place at T, but better off than $u^T(\theta^{*T})$ because some workers are being kept at jobs when the TC terminates.

3.2 Firing taxes, probation periods and the job destruction rate

Examination of eqn.(24) establishes that there is a close link between the two policy instruments. Namely, $d\widetilde{F}/dT < 0$ since $d\theta^*/dT > 0$ always. As T expands, J^{1*} increases (the job value curve shifts upwards). This is also true for regime 2, but this positive effect is partly offset by the more heavily discounted profits after T. As a result, J^{1*} increases faster than J^{2*} in T and hence a lower F is required to make firms willing to switch/stay to regime 1.

As the firing tax increases and approaches $\widetilde{F}$ from below, equilibrium unemployment rate rises, makes a jump upwards when $F = \widetilde{F}$ and remains fixed thereafter (while equilibrium market tightness decreases until $\widetilde{F}$ and then stays the same irrespective of F). The latter is depicted in Figure 3.

All the above have implications for the steady state job destruction rate i.e. the inflow of workers into the unemployment pool. When firms chose optimally not to dismiss employees at T, the job destruction rate is equal to δ. As the firing restriction becomes more harsh and exceeds the critical value $\widetilde{F}$, the job destruction rate makes an upward jump and remains constant for all $F > \widetilde{F}$. More specifically, its value is given by:

$$JDR = \delta \frac{1}{1 - e^{-\delta T}} \tag{29}$$

JDR rises because at each t a fraction δ of matches dissolves and an additional proportion of jobs is destroyed as it reaches the end of the fixed period. The only thing that matters now is the length of T. Indeed, eqn.(29) reveals that expansions of T cause JDR to decrease as a result of a less frequent dismissal.

Overall, heavy layoff costs are likely to induce employers to destroy matches at T. When this happens, the resulting job separation rate will increase and it will be more intensified the shorter the length of the TC is.

By taking the assumption of firing taxes as given, the analysis establishes a first theoretical approach within which such regulations can be examined explicitly. In this respect, it demonstrates the complexity of dismissal policies and offers a potential explanation for the observed patterns. Firstly, it suggests that temporary tenures are likely to be observed mostly when firing restrictions on regular contracts are more severe, something consistent with the data. Secondly, it argues that outflows of jobs and workers can be inversely affected by such ruling procedures, something which may be hidden behind the ambiguous empirical relationship between EPL and the job turnover rates.

4 Productivity Differences

This section discusses productivity differences in segmented markets and the effects of policy on worker groups of diverse skills.

Before proceeding, one must stress the importance of the assumptions governing the unemployment income. As the analysis suggests, this income is independent of worker skill. Clearly, this makes sense if the latter is defined to be imputed income from leisure activities. Of course, it can include other forms of income as well such as state provided unemployment benefit but these would have to be made proportional to p (or w). What turns out to be crucial for the results is that at least some portion of the income that has to be given up when transition from unemployment to employment takes place, is independent of productivity. This assumption reassures that market tightness and wages increase with skill and that unemployment rates fall. A second important thing is that skill markets are segmented. That is, each firm and worker participate solely in one market with the same level of productivity. Finally, the length of the probation period (or TC) must be irrespective of skill. This is actually not a very bad claim. The vast majority of real world policy schemes coincides with this assertion. In practice, some distinctions are made for blue and white collar workers but no other differentiation is made for the productivity differences within each group.

To facilitate the analysis, I will consider the simplest case possible, that is: two different levels of productivity which will be referred to as "high" and "low" skill. Given the discussion of the previous section one can formally derive the following Proposition:

Proposition 4 *Let p^h and p^l denote the productivity levels of high and low skilled workers respectively, with:*

$$p^h = ap^l, \text{ and } a > 1 \tag{30}$$

Then for any finite and common among skill groups T, it is true that:

$$\widetilde{F}^h > \widetilde{F}^l \text{ always} \tag{31}$$

Proof. *See Appendix B* ■

Proposition 4 establishes that there is a range of firing taxes such that for any $F \in (\widetilde{F}^l, \widetilde{F}^h)$, employers in high skilled jobs keep their workers while firms in low productivity matches dismiss employees at the end of T. Workers in these two segmented markets enjoy different wages, face different unemployment and job turnover rates not only because their different productivity levels determine different equilibrium market tightness but also because the initiation of such policy causes different firm responses.

The argument can be generalized. Hence, Proposition 5 follows:

Proposition 5 *Let there be a distribution of productivities in the economy with CDF $P(p)$. Then, there is a distribution of critical tax levels across different productivity groups, so that $G(F)$ is the proportion of firms that chose to destroy surviving matches at the end of T (where $G(\cdot)$ is the CDF of the firing restriction).*

Proof. *See Appendix B* ■

Based on Proposition 5, JDR is determined by:

$$JDR = G(F)\delta\frac{1}{1-e^{-\delta T}} + [1-G(F)]\delta \tag{32}$$

Clearly, a rise in the firing tax unambiguously amplifies the job destruction rate as it augments the proportion of jobs that are being destroyed at T.

4.1 Wage inequality

Given different tax thresholds among different productivity clusters, wage inequality is one of the first things that come immediately to mind. This is particularly relevant since the implementation of policies of this short is usually justified on the grounds of protecting lower-skilled groups that are more vulnerable to the unemployment risk and the reduction in real wages. For this reason, I now raise the question of whether wage inequality rises or falls when a policy is initiated.

Proposition 6 *Let ap^l and p^l denote the productivity levels of high and low skilled workers respectively, $\forall a > 1$. Then, for any increasing, concave and homogeneous of degree one matching function, wage inequality is highest when no policy is implemented and lowest when $T = 0$. For any finite and non-zero T, the wage differential increases with T and is more amplified when $F \in (\widetilde{F}^l, \widetilde{F}^h)$.*

Proof. *See Appendix B* ■

The reason that wage inequality decreases with policy is based on the proportionality of the firing tax to the productivity level. As a consequence, the downward shift of the job value curve is less smooth for the high-skilled group resulting in a reduction in the difference of the two equilibrium tightness values which in turn causes a decrease in the wage differential. Since temporary predetermined tenures introduce a tax-free period, it follows that inequality rises with T. Moreover, inequality is magnified whenever $F \in (\widetilde{F}^l, \widetilde{F}^h)$ because insiders' wage increases further relative to that of the other group and it is only high-skilled workers that become insiders. Overall, this is the most interesting result. Such policy designs may not only intensify job destruction margins but aggravate, at the same time, wage differentials by endogenously creating a dichotomy between insiders and outsiders i.e. employees who enjoy the benefits of protection and those who do not.

5 Computational experiments

In this section I provide computed solutions that can proliferate the model's implications for policy design and put to the test its ability to replicate real world examples. For the most part I will use the parameter values that are provided in Mortensen (1994). The numerical values for the fixed period and the level of firing taxes are deduced from OECD data, Guell (2003) and Garibaldi and Violante (2004).

The functional form of the aggregate matching function is assumed to be log linear, so that:

$$q(\theta) = A\theta^{-\eta}, \text{ for some } A > 0 \tag{33}$$

I normalize the time period to be one quarter and without loss of generality set the average productivity p equal to 1 while concentrating on the implications for the high productivity group ($p = 1.5$) and the low productivity one ($p = 0.5$) - which I assume to be of equal proportions. The interest rate is set to 0.01. The recruiting cost, the value of leisure and labor's share are fixed to 0.3, 0.349 and 0.5 respectively as in Mortensen (1994). In what follows, I will abstract from the possibility of search externalities[16] and concentrate only on efficient equilibrium outcomes by setting the elasticity of matches with respect to unemployment η equal to 0.5.

By trial and error, I adjust the values of A and δ so that on average the model reproduces an equilibrium unemployment rate around 10 percent and an expected duration of unemployment of four to five months. This gives me $A = 0.65$ and $\delta = 0.08$.

As far as the length of T is concerned, I use the information provided by the OECD

[16] See Hosios (1990).

regarding the maximum cumulated duration allowed for fixed term contracts (see Table 2, Panel B). For this reason I set T equal to 8, 10, 12 and 14[17]. Information for the firing taxes is not easily identified. Garibaldi and Violante (2004), using information from Guell (2003) estimate that the total firing costs in Italy endured by firms upon separation, amount to around seven monthly wages. The latter is adjusted for the relevant probability of a worker's appeal for unfair dismissal being granted. However, this estimate includes severance compensation as well and needs to be decomposed into its two different components. Garibaldi and Violante find that on average firing taxes are equal to around 24 to 34 percent of the entire firing charge incurred. Based on these findings, I assume that the policy maker decides for the level of the firing restriction according to the wage of the average productivity group ($p = 1$) that would have been agreed, should the temporary contract become permanent (since it is the stringency governing regular employment that is of main concern). The wage however is endogenously derived and as a result a numerical value cannot be explicitly computed. Therefore, I start with an initial guess for F and change it accordingly until the latter and the one implied by the equilibrium in regime 2 converge.

Simulation results are illustrated in Table 4. When the temporary contract lasts for 2 years there is no equilibrium in regime 1 (not reported). When the period is extended to 10 quarters, a firing tax residing at the higher band will induce lower productivity firms to destroy surviving matches at T. These suggest that the model demonstrates the ability to offer theoretically one candidate explanation as to why temporary contracts grew only modestly in countries like Ireland and Italy i.e. economies with quite short maximum cumulated period allowed.

As the period increases to 3 and 4 years, only modest firing charges are required to make employers of low productivity jobs willing to terminate the contract at T. This might replicate the cases of Portugal and Spain which allow quite prolonged TCs and have seen a remarkable expansion of temporary employment during the 1990's and early 2000's.

The average job destruction rates are clearly amplified by the presence of heavy dismissal costs. The percentage increase in average JDR ranges from 40 percent (when $T = 10$ and $F = 0.732$) to 24 percent (when $T = 14$ and $F = 0.631$).

Figures 4 and 5 deliver a clear illustration of the disadvantage of low productivity workers when common firing restrictions are in place. The wage differential increases with T (Figure 5) and jumps upwards when it is optimal for low-skilled firms to dismiss workers at the end of T. The area within the two curves in Figure 4 corresponds to low skilled workers being fired when the contract expires but high productivity matches, that have survived

[17]I set T equal to 14 as well, under the assumption that sometimes the temporary contract may be extended for a short period of time

to T, being retained. In an endogenous job destruction framework, tightening termination laws would reduce the separation rate in those matches that are preserved but aggravate it in the rest. The overall outcome would depend on the severity of the reform, the pre-existing composition of employment in terms of contractual agreements and on the distribution of productivity. It is this dualism of firing policies that may be responsible for the ambiguous overall patterns that we observe in the data.

6 Conclusions

Empirical results are to some extent inconclusive about the effects of dismissal policies on job and labor flows. Some countries have relatively elevated turnover rates despite their strict layoff policies. At the same time, temporary contractual agreements have seen a notable expansion in economies where heavy firing restrictions on regular employment have remained largely in place.

This paper has suggested one reason that could partially explain the observed phenomena. Probation periods (or temporary contracts) that enable firms to dissolve matches costlessly, may provide incentives to dispose off employees when this time period elapses, thereby increasing outflows into unemployment. In addition, the model predicts that the number of temporary job tenures will increase when termination costs on regular employment are high. Hence, it gives a clear warning to policy makers when planning the institutional arrangements. As the results suggest, the two policy instruments are closely linked and one should be cautious for the individual practices about to be exercised as they may influence the composition of employment, create groups of insiders and outsiders and affect the wage differentials among different productivity clusters.

On the purely empirical side, this work provides an additional motivation for collecting data regarding the transition rates of different skill groups. In that way, not only one could test the predictions of the model more accurately but provide insights for institutional design.

In any case, the structural differences in employment performance indicators call for theoretical improvements in the areas of friction and labor market flexibility modelling. That could be one way to deepen our understanding of the dynamics and try to reconcile some apparent inconsistencies.

Table 1
EPL rankings

	Regular employment		Temporary employment		Overall EPL strictness	
	Late 1980s	Late 1990s	Late 1980s	Late 1990s	Late 1980s	Late 1990s
Austria	2.6	2.6	1.8	1.8	2.2	2.2
Belgium	1.5	1.5	4.6	2.8	3.1	2.1
France	2.3	2.3	3.1	3.6	2.7	3.0
Germany	2.7	2.8	3.8	2.3	3.2	2.5
Ireland	1.6	1.6	0.3	0.3	0.9	0.9
Netherlands	3.1	3.1	2.4	1.2	2.7	2.1
Switzerland	1.2	1.2	0.9	0.9	1.0	1.0
UK	0.8	0.8	0.3	0.3	0.5	0.5
Greece	2.5	2.4	4.8	4.8	3.6	3.6
Italy	2.8	2.8	5.4	3.8	4.1	3.3
Portugal	4.8	4.3	3.4	3.0	4.1	3.7
Spain	3.9	2.6	3.5	3.5	3.7	3.1
Turkey	–	2.6	–	4.9	–	3.8
Denmark	1.6	1.6	2.6	0.9	2.1	1.2
Finland	2.7	2.1	1.9	1.9	2.3	2.0
Norway	2.4	2.4	3.5	2.8	3.0	2.6
Sweden	2.8	2.8	4.1	1.6	3.5	2.2
Czech Rep.	–	2.8	–	0.5	–	1.7
Hungary	–	2.1	–	0.6	–	1.4
Poland	–	2.2	–	1.0	–	1.6
Canada	0.9	0.9	0.3	0.3	0.6	0.6
Mexico	–	2.3	–	–	–	–
US	0.2	0.2	0.3	0.3	0.2	0.2
Australia	1.0	1.0	0.9	0.9	0.9	0.9
Japan	2.7	2.7	–	2.1	–	2.4

Notes to Table 1: *Source is* OECD Employment Outlook 1999.

Table 2

Panel A: Trial period (in months)

	Late 1980s	Late 1990s
Austria	1.0	1.0
Belgium	3.3	3.3
France	1.6	1.6
Germany	6.0	6.0
Ireland	12.0	12.0
Netherlands	2.0	2.0
Switzerland	2.0	2.0
UK	24.0	24.0
Greece	2.0	3.0
Italy	0.8	0.8
Portugal	1.0	2.0
Spain	1.7	2.5
Denmark	1.5	–
Finland	4.0	4.0
Norway	1.0	1.0
Sweden	6.0	6.0
Canada	3.0	3.0
US	–	–

Panel B: Regulation of Fixed-term contracts

	Maximum cumulated period allowed (in months)	
	Late 1980s	Late 1990s
Belgium	24.0	30.0
France	24.0	18.0
Germany	18.0	24.0
Ireland	12.0	12.0
Italy	9.0	15.0
Portugal	30.0	30.0
Spain	36.0	36.0

Notes to Table 2: *Source is* OECD Employment Outlook 1999.

Table 3

Estimation results

Dependent variable	TE	TE	TE	TE
Adjusted R^2	0.17	0.14	0.37	0.40
Constant	5.19*	5.93**	4.93	3.65
	(3.15)	(3.18)	(4.12)	(4.27)
EPL_RE	3.24**		2.67**	
	(1.34)		(1.21)	
DD		2.28**		2.21**
		(1.05)		(0.91)
UR			0.53*	0.61**
			(0.31)	(0.30)
$LPGR$			-3.04**	-3.08**
			(1.00)	(0.97)
$GDPGR$			1.11*	1.23*
			(0.78)	(0.77)

Notes to Table 3: *Sources are* OECD Statistical Compendium 2003 and OECD Employment Outlook 1999.*(**) denotes stat. significance at 10% (5%) level. TE is temporary employment as % of total dependent employment (average 1998-2002), EPL_RE is employment protection legislation for regular employment (late 1990s), DD denotes difficulty of dismissal (late 1990s), UR is unemployment rate (average 1998-2002), $LPGR$ denotes labor productivity % change (average 1998-2002) and $GDPGR$ is real GDP growth rate (average 1998-2002). The sample includes 24 countries: Austria, Belgium, Canada, Czech Republic Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, UK and US. For the multivariate regression, 23 observations were used since there were no data for $LPGR$ for Turkey.

Table 4

Simulation results

	High productivity ($p = 1.5$)			Low productivity ($p = 0.5$)		
			$T = 10$ (2.5 years)			
	$F = 0.520$	$F = 0.626$	$F = 0.732$	$F = 0.520$	$F = 0.626$	$F = 0.732$
$\tilde{F}$		1.138			0.656	
u	7.92%	7.96%	8.01%	13.14%	13.32%	**21.90%**
JDR	8.00%	8.00%	8.00%	8.00%	8.00%	**14.52%**
			$T = 12$ (3 years)			
	$F = 0.522$	$F = 0.629$	$F = 0.735$	$F = 0.522$	$F = 0.629$	$F = 0.735$
$\tilde{F}$		1.03			0.60	
u	7.89%	7.93%	7.96%	13.00%	**19.65%**	**19.65%**
JDR	8.00%	8.00%	8.00%	8.00%	**12.96%**	**12.96%**
			$T = 14$ (3.5 years)			
	$F = 0.523$	$F = 0.631$	$F = 0.738$	$F = 0.523$	$F = 0.631$	$F = 0.738$
$\tilde{F}$		0.967			0.565	
u	7.87%	7.89%	7.92%	12.88%	**18.06%**	**18.06%**
JDR	8.00%	8.00%	8.00%	8.00%	**11.87%**	**11.87%**

Notes to Table 4: T is measured in quarters. The values for F are based on 24, 29 and 34 percent of seven months' wages of average productivity ($p = 1$) that is agreed, when the temporary contract becomes permanent. The rest of the parameter values are: $A = 0.65$, $\delta = 0.08$, $r = 0.01$, $c = 0.3$, $b = 0.349$, $\beta = 0.5$ and $\eta = 0.5$. Numbers in bold indicate equilibrium in regime 1

Figure 1a: Employment Protection Legislation and Job Turnover

Late 1980s

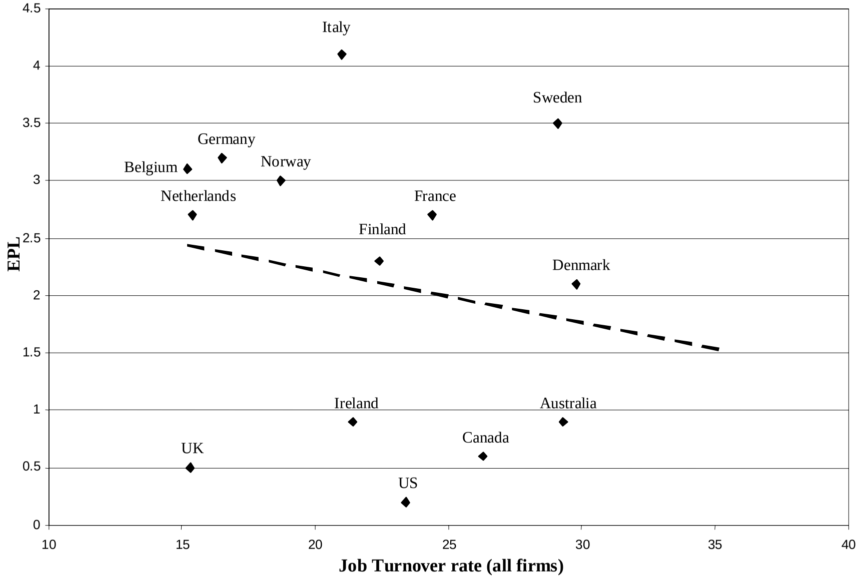


Figure 1b: Employment Protection Legislation and Job Turnover

Late 1980s

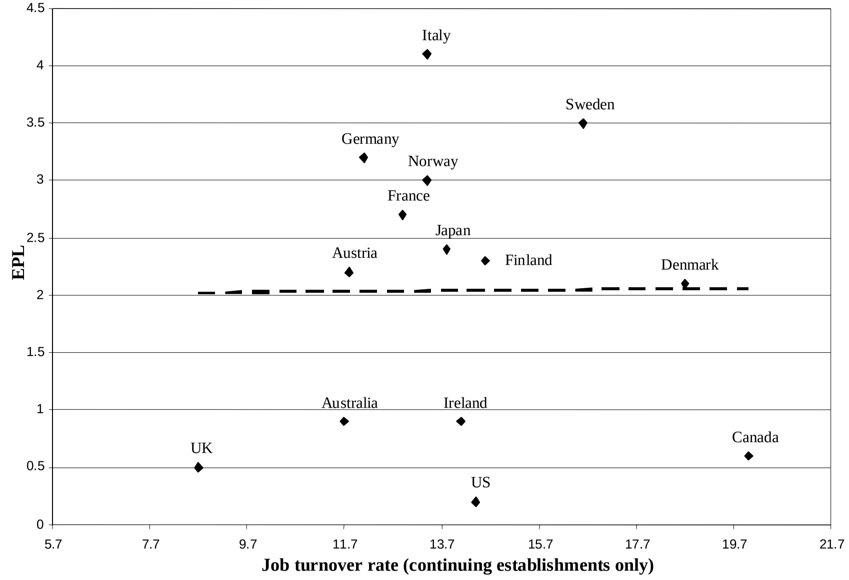


Figure 2a: Difficulty of Dismissal and Job Turnover

Late 1980s

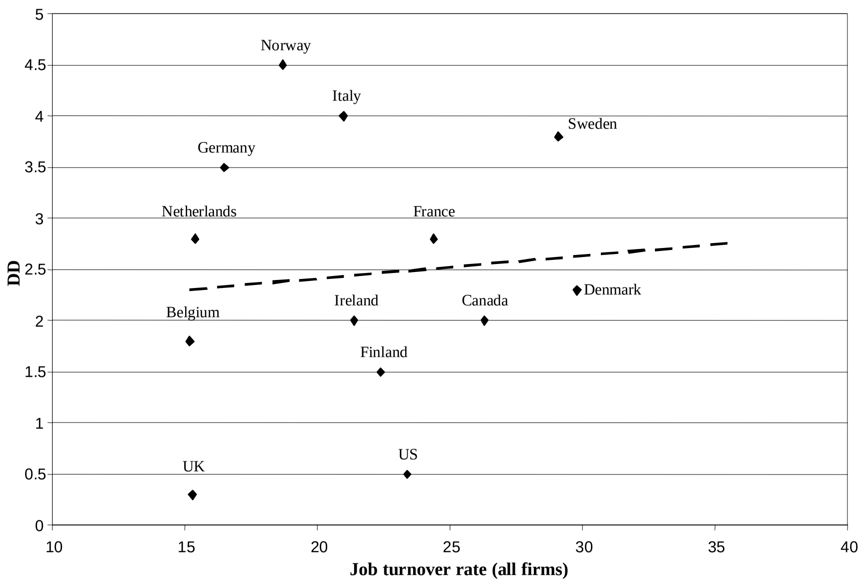


Figure 2b: Difficulty of Dismissal and Job Turnover

Late 1980s

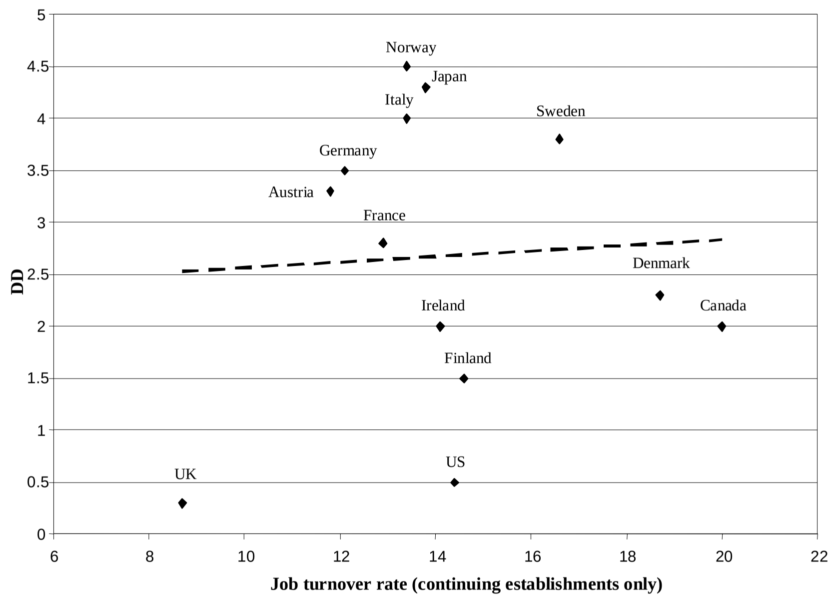


Figure 3: Equilibrium unemployment rate and firing tax

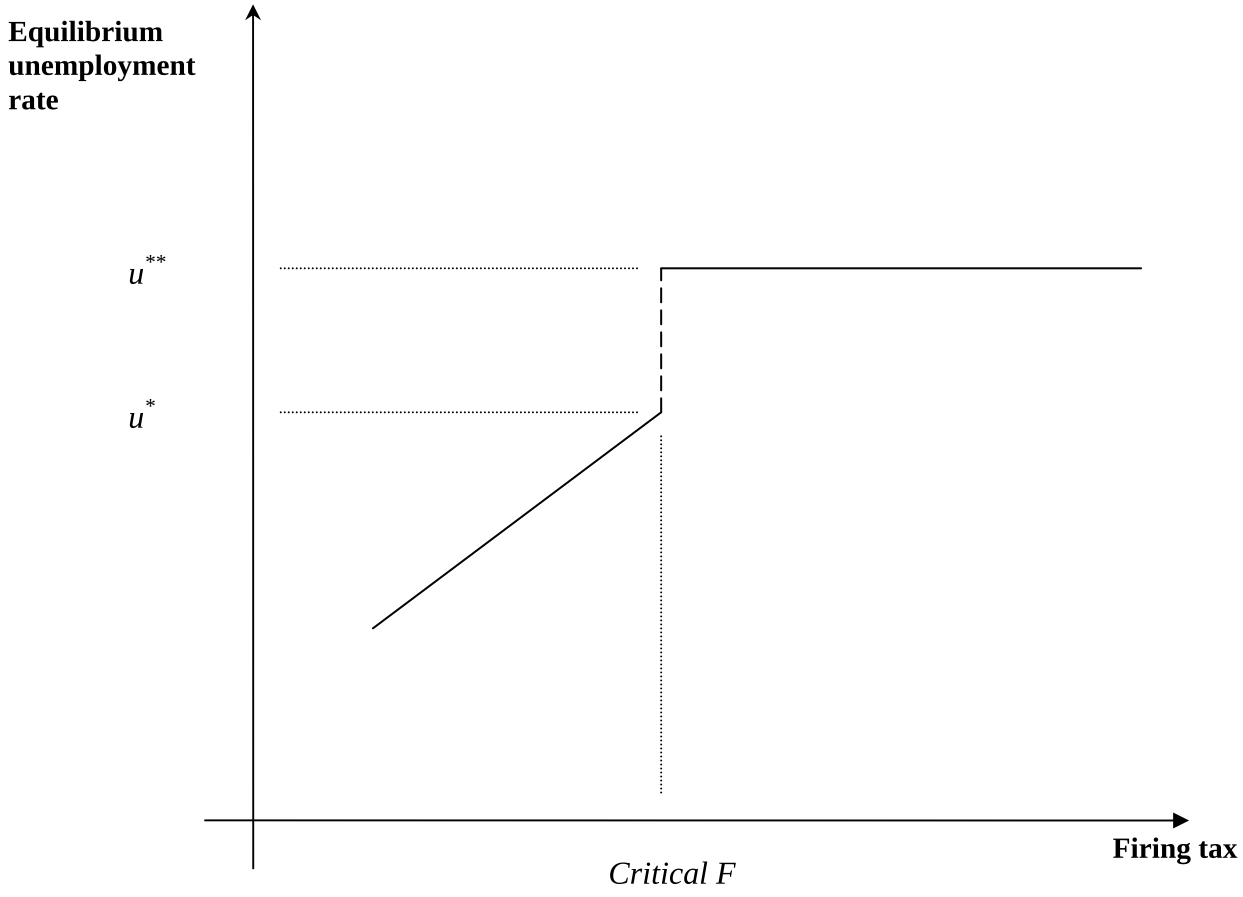


Figure 4: Simulations
Regions of *T* and *F* for high and low productivity matches

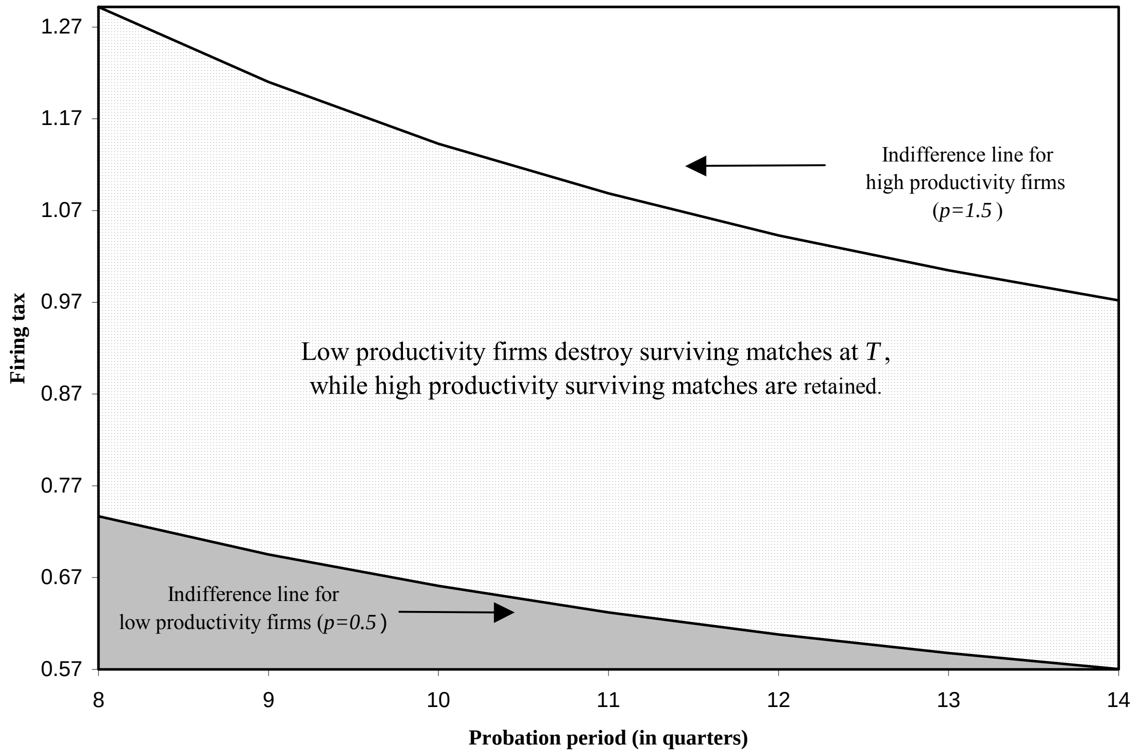
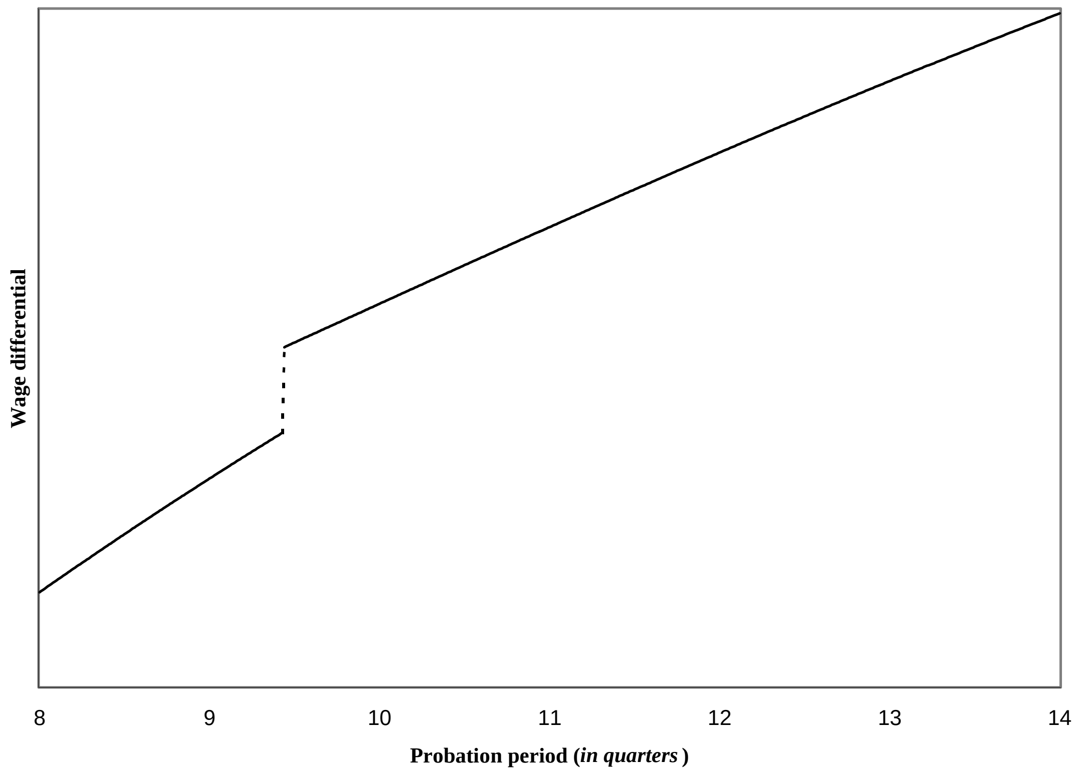


Figure 5: Simulations
Wage inequality and *T*



Appendices

A Wage determination

To derive the wage in regime 1 we use the first order condition $\beta\left[J^1(t) - V^1\right] = (1 - \beta)\left[W^1(t) - U^1\right]$. Given eqn.(3) and eqn.(4) we have:

$$\beta J^1(t) = \int_t^T \beta[p - w_1]e^{-(r+\delta)(s-t)}ds \tag{A1}$$

and

$$(1-\beta)[W^1(t) - U^1] = \int_t^T (1-\beta)[w_1 - rU^1]e^{-(r+\delta)(s-t)}ds \tag{A2}$$

Subtracting the two equations and by taking into account that $V^1 = 0$:

$$0 = \int_t^T [\beta p - w_1 + (1-\beta)rU^1]e^{-(r+\delta)(s-t)}ds \tag{A3}$$

Differentiating eqn.(A3) wrt t, we obtain:

$$w_1 = \beta p + (1-\beta)rU^1 \tag{A4}$$

Consider now that $W^1 - U = \frac{\beta}{1-\beta}J^1 = \frac{\beta}{1-\beta}\frac{pc}{q(\theta)}$ and substitute it into eqn.(5) to get:

$$rU^1 = z + \theta pc\frac{\beta}{1-\beta} \tag{A5}$$

Hence, eqns. (A5) and (A4) imply that:

$$w_1 = (1-\beta)z + \beta p(1 + c\theta) \tag{A6}$$

The wage profile is constant in t since both, employer and employee make capital losses as $t \to T$. These losses must be shared according to the Nash bargaining procedure. Implicit to this of course is the fact that the wage is renegotiated continuously.

To derive the wage in eqn. (19), we first note that:

$$\beta J^2(T) = \beta\frac{p - w_{2T} - \delta pF}{r+\delta} \tag{A7}$$

and that:

$$(1-\beta)[W^2(T) - U^2] = (1-\beta)\frac{w_{2T} - rU^2}{r+\delta} \tag{A8}$$

Using the sharing rule $\beta\left[J^{2T}+pF-V^{2}\right]=(1-\beta)\left[W^{2}-U^{2}\right]$, and eqns. (A7) and (A8) we obtain:

$$w_{2T}=\beta p+(1-\beta)rU^{2}+\beta rpF \tag{A9}$$

and by substituting rU^{2} out of (A9):

$$w_{2T}=(1-\beta)z+\beta p(1+c\theta)+\beta rpF \tag{A10}$$

The initial wage (w_2) is then determined by taking the sharing rule $\beta\left[J^{2T}+pF-V^{2}\right]=(1-\beta)\left[W^{2}(t)-U^{2}\right]$ as given.

w_2 is irrespective of F because the worker has still no credible threat to negotiate an increase since she knows that if she is fired at any t before T, the firm will not have to incur any firing cost. It is this asymmetry between the two parties that causes the wage to be lower in all negotiations for $t\in[0,T]$.

B Proofs of propositions

Proof of Proposition 1

The optimality of "dismissal at T" implies that:

$$J^{1}(\theta^{*})\geq J^{2}(\theta^{*}) \tag{B1}$$

Note that this rule is always time consistent in the sense that it reassures the optimality of the response at T as well. The intuition for this is simple: dismissal at T will be optimal if expected profits from continuation are non-positive. Substituting θ^{*} into J^{2} results in $J^{2}(\theta^{*})=J^{1}(\theta^{*})+J^{2T}(\theta^{*})$. By implication of eqn.(B1), the optimallity rule is reduced to:

$$J^{2T}(\theta^{*})\leq 0 \tag{B2}$$

which defines the following "critical level" of the firing tax:

$$F^{*}=\frac{\left[p-(1-\beta)\,z-\beta p\,(1+c\theta^{*})\right]}{p(\beta r+\delta)} \tag{B3}$$

Proof of Proposition 2

The proof of Proposition 2 is analogous to that of Proposition 1 with the optimally rule now being:

$$J^{1}(\theta^{**})\leq J^{2}(\theta^{**}) \tag{B4}$$

which implies:

$$J^{2T}(\theta^{**}) \geq 0 \tag{B5}$$

This gives rise to the following firing tax:

$$F^{**} = \frac{[p - (1-\beta)\,z - \beta p\,(1 + c\theta^{**})]}{p(\beta r + \delta)} \tag{B6}$$

Proof of Proposition 3

The result follows directly by setting $F = F^{**}$ and substituting into eqn.(20). Doing so produces:

$$[p - (1-\beta)z - \beta p(1 + c\theta^{**})]\,(1 - e^{-(r+\delta)T}) - (r+\delta)\frac{pc}{q(\theta^{**})} = 0 \tag{B7}$$

Comparing eqns.(10) and (B7), it immediately follows that $\theta^* = \theta^{**}$ and by eqns.(21) and (22) we have that $F^* = F^{**}$. Apparently, one derives the same result by setting $F = F^*$ and substituting into eqn.(10).

Proof of Proposition 4

The first thing we need to establish is that θ^* is higher than θ^{**}. This is merely a result driven by the fact that high-skill workers enjoy lower relative returns from leisure activities. The two equilibrium values are determined by:

$$(r+\delta)\frac{p^l c}{q(\theta^{*h})} + \beta p^l c\theta^{*h}[1 - e^{-(r+\delta)T}] = [p^l - \frac{(1-\beta)z}{a} - \beta p^l][1 - e^{-(r+\delta)T}] \tag{B8}$$

for high skilled when $F = \widetilde{F}^h$, and

$$(r+\delta)\frac{p^l c}{q(\theta^{*l})} + \beta p^l c\theta^{*l}[1 - e^{-(r+\delta)T}] = [p^l - (1-\beta)z - \beta p^l][1 - e^{-(r+\delta)T}] \tag{B9}$$

for low skilled when $F = \widetilde{F}^l$. Since the l.h.s.'s in both equations are increasing in market tightness, it immediately follows that for any $a > 1$, $\theta^{*h} > \theta^{*l}$. Given the derivation of the critical tax in eqn.(24), the difference between $\widetilde{F}^h$ and $\widetilde{F}^l$ is given by:

$$\widetilde{F}^h - \widetilde{F}^l = \frac{(1-\beta)z}{p^l(\beta r + \delta)}\left(\frac{a-1}{a}\right) - \frac{\beta c}{\beta r + \delta}\left(\theta^{*h} - \theta^{*l}\right) \tag{B10}$$

Therefore, the relevant question is whether $\theta^{*h} - \theta^{*l} \lesseqgtr \dfrac{(1-\beta)z}{p^l c\beta}\left(\dfrac{a-1}{a}\right)$.

Let

$$\theta^{*h} - \theta^{*l} = \frac{(1-\beta)z}{p^l c\beta}\left(\frac{a-1}{a}\right) \tag{B11}$$

Then subtracting eqn.(B9) from eqn.(B8) and substituting $\theta^{*h} - \theta^{*l}$ out from eqn.(B11), we find that $(r+\delta)c\left(\frac{1}{q(\theta^{*h})} - \frac{1}{q(\theta^{*l})}\right) = 0$ which cannot be true since $\theta^{*h} > \theta^{*l}$ implies that $\frac{1}{q(\theta^{*h})} > \frac{1}{q(\theta^{*l})}$.

Assume now that:

$$\theta^{*h} - \theta^{*l} > \frac{(1-\beta)z}{p^l c\beta}\left(\frac{a-1}{a}\right) \tag{B12}$$

say $\theta^{*h} - \theta^{*l} = \Delta\frac{(1-\beta)z}{p^l c\beta}\left(\frac{a-1}{a}\right)$ for some $\Delta > 1$. Then eqns.(B8), (B9) and (B12) imply that $(r+\delta)c\left(\frac{1}{q(\theta^{*h})} - \frac{1}{q(\theta^{*l})}\right) < 0$ which can never be true. Hence it must be that $\theta^{*h} - \theta^{*l} < \frac{(1-\beta)z}{p^l c\beta}\left(\frac{a-1}{a}\right)$ and thus:

$$\widetilde{F}^h - \widetilde{F}^l > 0 \tag{B13}$$

Proof of Proposition 5

Let $P(p)$ be the CDF of productivities across segmented markets. Since $\widetilde{F}$ is a continuous function of p then it follows that there is a distribution of $\widetilde{F}$ in the economy with e.g. $G(\widetilde{F})$ as the CDF. Thus, for any actual firing restriction F, $G(F)$ represents the percentage of firms that chose to get rid off the match at the end of the probation period.

Proof of Proposition 6

To establish the result in Proposition 6 we make use of eqn.(10) and subtract the two equilibrium conditions (i.e. when both productivity groups destroy at T) to obtain:

$$\begin{aligned}&[1-e^{-(r+\delta)T}][(1-\beta)z\frac{a-1}{a} - \beta p_l c(\theta^h - \theta^l)] - \\ &+(r+\delta)p_l c[\frac{1}{q(\theta^h)} - \frac{1}{q(\theta^l)}] = 0\end{aligned} \tag{B14}$$

Now note that when T tends to infinity, eqn.(B14) refers to the "no tax" case. As T increases from 0 to ∞, the l.h.s. of eqn.(B14) increases as well. Since the l.h.s. is decreasing in $\theta^h - \theta^l$ it is true that $(\theta^h - \theta^l)$ increases as T rises, for any decreasing choice of $q(\cdot)$. Since the wage differential (Δw) is increasing in $\theta^h - \theta^l$ it follows that Δw rises as T rises: Given that the wage of high productivity insiders has a firing tax component while the low productivity outsiders are not protected by such regulations, Δw is amplified when T is finite and $F \in (\widetilde{F}^l, \widetilde{F}^h)$.

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