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Heterogene Arbeit: Positive und Normative
Aspekte der Qualifikationsstruktur der Arbeit

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Experience Rated Unemployment Insurance: Was Europe Right Not to Choose It?

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Abstract:

Theoretical economic literature dealing with the financing of unemployment insurance finds that experience rating helps to solve the externality caused by individual efficient but socially inefficient dismissals and, hence, reduces unemployment. This is, however, found in models where workers and firms bargain over wages individually. Introducing unionized wage bargaining - which at in least continental Europe is a defining feature of the economy - generally gives highly ambiguous results; even opposite results can be obtained showing that the introduction of experience rating increases unemployment.

JEL Classification : J 30, J 64, J 65, J 68
Keywords : experience rating, search and matching models, unemployment, unemployment insurance, unions

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July 5, 2007

Abstract

Theoretical economic literature dealing with the financing of unemployment insurance finds that experience rating helps to solve the externality caused by individual efficient but socially inefficient dismissals and, hence, reduces unemployment. This is, however, found in models where workers and firms bargain over wages individually. Introducing unionized wage bargaining - which at in least continental Europe is a defining feature of the economy - generally gives highly ambiguous results; even opposite results can be obtained showing that the introduction of experience rating increases unemployment.

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1 Introduction

Many economists have concluded that experience rated unemployment insurance reduces unemployment (see a description of the literature below). As continental Europe faces relatively high and persistent unemployment rates (OECD, 2004), it comes as a surprise that no European country has adopted such an insurance plan despite calls by policy advisors for such a system (European Commission, 2004, German Council of Economic Experts, 2003 or L'Haridon and Malherbet, 2002). France has already introduced experience rating - at least in part - through the *Delalande tax*, where firms which fire workers above the age of 50 have to pay part of the unemployment benefits (see also Behaghel et al., 2005). Since 2005, after the introduction of the *Hartz IV-legislation*, in Germany, an employer that lays off a long-standing worker above the age of 55 may be obliged to pay his unemployment benefits (*Arbeitslosengeld I* which is basically restricted to one year but may be extended to up to 18 months for elderly workers) and can be forced to pay other social security costs as pension or health insurance contributions up to 32 months according to §147a of the *Sozialgesetzbuch* (social code).[1] Experience rating exists in the USA and indeed, its introduction seems to have raised employment (Anderson and Meyer, 2000). This leads us to ask why experience rating has not (or only partly) been introduced in Europe and whether there exist differences between the USA and Europe which might have made policy makers interested in reducing unemployment right not to introduce experience rating.

To not keep the reader on tenterhooks, the answer to the latter question is: yes, maybe.[2] The basic story behind the negative effect of experience rating on unemployment found in the theoretical literature is that each individually efficient dismissal from a firm-worker pair's perspective generates social costs if unemployment insurance is financed through employment taxes. This is because the newly unemployed worker places an additional financial burden on the insurance system, while it lacks his contributions. Dismissal taxes force firms to take those social costs into account when laying off a worker. They can, therefore, be interpreted as a type of Pigouvian tax that internalizes the externalities and can, under certain circumstances, reduce the total tax burden that firms have to bear. This issue has recently been discussed in Blanchard and Tirole (2004), Cahuc and Malherbet (2004), Cahuc and Zylberberg (2005), Fath and Fuest (2005) and Baumann and Stähler (2006). Earlier contributions are include Feldstein (1976), Burdett and Wright (1989), and Marceau (1993). Blanchard and Tirole (2004) show that dismissal taxes should be part of an optimal design of unemployment insurance to make firms internalize the costs of the benefits provided.

[1]In the Nordic countries, an alternative experience rated unemployment insurance system connected to union membership - though not directly associated with the kind of experience rating modelled in this paper and heavily subsidized by the government - has been introduced through the *Gent model* (for a detailed description of these insurance systems see Björklund and Holmund, 1991 for Sweden, Sinko, 2001 for Finland and Parson et al., 2003 for Denmark).

[2]Note that the focus of the analysis is positive. We will deal with the effects experience rating has on unemployment, while considerations about the optimal level of unemployment from an efficiency perspective are not addressed. This issue should, nevertheless, certainly be the subject of further research.

Similarly, Cahuc and Zylbergerg (2005) present a model of optimal taxation and find that dismissal taxes to finance unemployment insurance could significantly increase employment and GDP. The inability to analyze the job creation process has been overcome by Cahuc and Malherbet (2004). They find that while the positive effect on employment remains intact, job creation decreases when dismissal taxes are introduced. The model they use is a matching model with endogenous job creation and destruction. The unemployment insurance is financed by dismissal and employment taxes, while its total expenditure is fixed. Raising dismissal taxes results in fewer dismissals, yet, job creation is also reduced. The latter effect is dominated by the first effect, which results in a generally positive effect on employment. Baumann and Stähler (2006) show, in a related model where unemployment benefits are fixed but the total expenditure varies with the unemployment rate, that increasing the extent of experience rating in the unemployment insurance can indeed increase job creation. This will be the case if the unemployment insurance system is located on the upward sloping section of the Laffer curve regarding employment taxes and as long as the insurance is not yet fully financed through dismissal taxes.

The aforementioned models basically consider individual wage bargaining between workers and firms or wage setting by employers. However, continental European economies are highly unionized. In the following, we present a matching model in the manner of Mortensen and Pissarides (1994) perfectly in line with Baumann and Stähler (2006) enhanced by unionized wage bargaining. In doing so, we follow the approach of Garibaldi and Violante (2005). The matching process differs slightly from the conventional process in the manner of Mortensen and Pissarides (1994) but allows us to differentiate between insider and outsider workers more easily while containing the same features. The different matching framework is, therefore, not important for the results achieved.[3] The unionized wage setting, however, indeed makes a difference. We assume an insider-dominated monopoly union that maximizes the gain from employment over unemployment. The government maintains a mandatory unemployment insurance system that is financed by employment and dismissal taxes. When switching the financing scheme of the unemployment insurance towards a system of experience rating, i.e. introducing or augmenting dismissal taxes to substitute for employment taxes, the effects with unionized wage bargaining can be described in three steps.

First, the introduction or augmentation of dismissal taxes makes dismissals more costly. Neglecting the wage effects and the budget effects of the unemployment insurance, this *ceteris paribus* reduces the incentive for job destruction but also for job creation and, hence, decreases labor reallocation.

Second, still neglecting the budget effect, a decrease in labor reallocation and the corresponding increase in the union's marginal utility losses due to higher wage claims resulting from discounting *ceteris paribus* decreases the union's wage claim and utility. As this is antic-

[3] To prove this, the analysis of Baumann and Stähler (2006), adapted to the model framework presented here, is presented in Appendix C. The reader who believes our claim and is acquainted with Baumann and Stähler (2006) might want to skip that section.

ipated by the union, it forces firms to augment dismissal probability through its wage setting behavior which, in turn, increases labor costs. The rise in labor costs overcompensates the augmented dismissal costs *ceteris paribus* resulting in a reduced job creation whereas job destruction increases, unambiguously augmenting unemployment (see also Stähler, 2007).

Third, higher dismissal taxes *ceteris paribus* decrease employment taxes required to achieve a balanced budget which reduces direct labor costs. However, this decrease in direct labor costs is diminished, as the union's wage claims additionally increase with decreasing employment taxes (again due to the improved bargaining position of unions). The effect on direct labor costs, i.e. wages plus employment taxes, is theoretically ambiguous. However, the change in direct labor costs plus increased dismissal taxes unambiguously reduces the incentive for job creation as total expected labor costs (including firing costs) increase on the one hand. On the other hand, it is ambiguous what happens to the layoff decision. Higher dismissal costs are opposed to a potential increase in direct labor costs (higher wages and an unclear effect on employment taxes). Nevertheless, it can be shown that the introduction of experience rating (i.e. the introduction of dismissal taxes in a situation where unemployment insurance has initially been financed solely by employment taxes) unambiguously increases unemployment as the reduction of job creation will always overcompensate the job destruction effect (even if the introduction of dismissal taxes yields fewer dismissals). To our knowledge, this is the only theoretical paper showing that experience rating can indeed increase unemployment in a matching model.[4]

We will proceed as follows. In section 2, we describe the basic structure of the model, introduce unionized wage bargaining and derive the resulting equilibrium. Section 3 addresses the effects of the introduction of experience rated unemployment insurance under unionized wage bargaining. In section 4, the main findings are summarized. A general mathematical appendix is added. Further, Appendices C and D prove that, for individual wage bargaining, the different matching framework still produces the same effects present in Baumann and Stähler (2006).

2 The Basic Model and Equilibrium

The economy is continuous in time, where population is normalized to one. There is a large supply of potential firms. Agents discount at rate r. The labor market is characterized by search frictions. This is captured by a fixed measure v of matching licences that can be rented by firms each period at cost q. Potential firms compete for the matching licences, while free market entry guarantees that the steady-state value of a vacancy will be zero due to an according price alignment of q. Vacant jobs and unemployed workers, u, meet

[4]Note that Cahuc and Malherbet (2004) find that experience rating yields fewer dismissals and less job creation. In their setting, simulations show that the reduced dismissal probability overcompensates the job creation effect, yielding positive employment effects. In the setting presented here, the opposite relationship holds due to the unionized wage setting framework.

randomly, where $\alpha > 0$ is the fixed contact rate for an unemployed worker. There is no on-the-job search. This implies that the contact rate for a vacant job can be expressed as $(\alpha u)/v$. Upon meeting, the initial productivity level of the job, x, is drawn from a cumulative distribution function $G(x)$, where $g(x)$ denotes the corresponding density function. For simplicity and without loss of generality, we assume that $x \in [0, 1]$. Only after the parties meet is realization of the idiosyncratic productivity component x revealed. This implies that a contact might not necessarily lead to job creation. Only if the idiosyncratic productivity component exceeds some endogenously determined threshold value, R_o, is a job created. After a successful match, firms move to production and release the costly matching licence, which is immediately rented out to another vacant firm. This matching framework differs from the conventional matching in line with Mortensen and Pissarides (1994). It nevertheless has the same features, as is widely discussed in Garibaldi and Violante (2005, pp. 807-808).

After the match has been formed, the worker starts production with productivity x drawn upon the meeting. However, there are idiosyncratic productivity shocks that hit a firm-worker pair at a Poisson rate $\lambda > 0$. In the case of a shock, a new idiosyncratic productivity is drawn from the distribution function $G(x)$. If productivity falls below an endogenously determined threshold value, R_i, the job is destroyed and firms have to pay a dismissal tax, T. Note that R_o is the threshold value for newly created jobs (outsider reservation productivity), whereas R_i denotes the threshold for existing jobs (insider reservation productivity). The subscripts o and i stand for outsiders and insiders, respectively.

The government maintains a mandatory unemployment insurance system that is financed by lump-sum employment taxes, t, per employed worker and dismissal taxes, T, per layoff. Unemployment benefits are exogenously fixed at b per period and paid to each unemployed worker.

The value of a vacant firm, V, can then be expressed by the following Bellman equation

$$rV = -q + \frac{\alpha u}{v} \left(\int_{R_o}^{1} J_o(x) dG(x) - [1 - G(R_o)]V \right), \tag{1}$$

where $J_o(x)$ captures the value of a newly created job with productivity x. The value for jobs can be stated as

$$(r + \lambda) J_k(x) = x - w_k(x) - t + \lambda \int_{R_i}^{1} J_i(x) dG(x) - \lambda G(R_i) T, \tag{2}$$

where $k = o, i$ indicates whether the firm employs an insider or an outsider, respectively. Analogously, the utility flow of an employed worker can be expressed by the Bellman equation

$$(r + \lambda) W_k(x) = w_k(x) + \lambda \int_{R_i}^{1} W_i(x) dG(x) + \lambda G(R_i) U, \tag{3}$$

where the utility of an unemployed worker, U, can be written as

$$rU = b + \alpha \left(\int_{R_o}^{1} W_o(x) dG(x) - [1 - G(R_o)]U \right). \tag{4}$$

Unemployment is determined by inflows into unemployment, $(1-u)\lambda G(R_i)$, and outflows out of unemployment, $u[1-G(R_o)]\alpha$, according to the job destruction and job creation conditions which are derived below. In the steady state, the change in unemployment is zero and the rate is thus given by

$$u = \frac{\lambda G(R_i)}{\lambda G(R_i) + \alpha[1-G(R_o)]}. \tag{5}$$

As the government finances unemployment benefits, b, per unemployed worker, u, through dismissal taxes, T, in the case of a layoff and a lump-sum tax, t, per employed worker, the budget constraint reads

$$bu = (1-u)t + (1-u)\lambda G(R_i)T. \tag{6}$$

Given the equations just described, the equilibrium of the economy is formally defined according to

Definition 1 *The steady-state equilibrium with given policy parameters b and T is a set of value functions $\{V, J_o(x), J_i(x), U, W_o(x), W_i(x)\}$, a pair of reservation productivities $\{R_i, R_o\}$, a pair of wage rules $\{w_i(x), w_o(x)\}$, a rental price for matching licences, q, an unemployment rate, u, and an employment tax, t, that satisfy the following conditions:*

1. *there is free market entry in the matching market and, thus, from $V = 0$, and equation (1) $q = (\alpha u/v)\int_{R_i}^{1} J_o(x)dG(x)$;*
2. *the optimal reservation productivity for job creation is given by $J_o(R_o) = 0$;*
3. *the optimal reservation productivity for job destruction is given by $J_i(R_i) = -T$;*
4. *wages are determined by equation (13) when set by the union, where $w_k(x) = \omega$ for all x and $k = i, o$, and by equations (32) and (33) when bargained individually (see Appendix C);*
5. *the value functions (J_o, J_i, W_o, W_i, U) are determined by equations (2) to (4);*
6. *the equilibrium unemployment rate is determined by equation (5);*
7. *the government's budget is balanced, i.e. t is chosen such that equation (6) holds.*

To integrate unionized wage bargaining into the matching model, we assume that a monopoly union sets a wage, ω, binding for all workers in the economy. Several different union utility functions have been discussed in the literature. Trade unions can be utilitarian, maximizing the sum of their members' utility (either employed or unemployed). Or the union is considered to be insider-dominated, i.e. it maximizes the gain of its members from employment over unemployment. It remains an open empirical question which objective is pursued (see Goerke et al., 2007, Booth, 1995, Pencavel, 1991, and Oswald 1982, 1993).

We assume that the union solely maximizes the gain from employment over unemployment, i.e. the difference between the utility of employment and unemployment, following Stähler (2007).[5] Using equations (3) and (4), the union's utility can be expressed as

$$\Omega(\omega) = W(\omega) - U = \frac{\omega - rU}{r + \lambda G(R_i)} = \frac{\omega - b}{r + \lambda G(R_i) + \alpha[1 - G(R_o)]} \tag{7}$$

in equilibrium. The union maximizes its utility, equation (7), with respect to ω subject to

$$R_i - t + \frac{\lambda}{r+\lambda} \int_{R_i}^{1} (x - R_i) dG(x) = \omega - rT, \tag{8}$$

and

$$R_o - t + \frac{\lambda}{r+\lambda} \int_{R_i}^{1} (x - R_i) dG(x) = \omega + \lambda T, \tag{9}$$

which are the firm-level job destruction and creation conditions for any given wage, ω, derived by the equilibrium Definition 1 which states that jobs are destroyed as soon as $J_i(R_i) = -T$ and jobs are created if $J_o(R_o) = 0$. Note that we see from equations (8) and (9) that $R_i = R_o - (r + \lambda)T$, which implies that reservation productivity for outsiders is higher than it is for insiders for $T > 0$ as they have to compensate the expected dismissal costs. It is straightforward to show by totally differentiating equations (8) and (9) that insider and outsider reservation productivity both increase with a rising wage, ω,

$$\frac{dR_i}{d\omega} = \frac{dR_o}{d\omega} = \frac{r + \lambda}{r + \lambda G(R_i)} > 0. \tag{10}$$

A higher wage increases labor costs and results in the need for a more productive worker (either insider or outsider) in order to generate a sufficiently large job value. Hence, increasing the wage level *ceteris paribus* results in more job destruction and less job creation. The first-order condition of the maximization problem given in equation (7) reads

$$\frac{1}{[r + \lambda G(R_i) + \alpha[1 - G(R_o)]]} = \frac{\omega - b}{[r + \lambda G(R_i) + \alpha[1 - G(R_o)]]^2} \left[\lambda g(R_i) \frac{dR_i}{d\omega} - \alpha g(R_o) \frac{dR_o}{d\omega} \right], \tag{11}$$

where the lhs represents the marginal gain due to an increase in the wage, ω, whereas the rhs is the corresponding utility loss. The latter stems from the effects of higher wage claims on discounting. It is represented by the change in the job reallocation rate (hereinafter JR) owing to a higher wage claim, $\lambda g(R_i) \frac{dR_i}{d\omega} - \alpha g(R_o) \frac{dR_o}{d\omega}$ (i.e. an increased dismissal probability

[5] Note that the assumption of such a utility function does indeed partly drive the results derived below. See Stähler (2007) and the literature therein for a discussion of the problems of introducing unions into models with search frictions.

and a decreased re-employment probability),[6] multiplied by the corresponding discounted utility, $\frac{\omega}{[r+\lambda G(R_i)+\alpha[1-G(R_o)]]^2} = \frac{\Omega(\omega)}{[r+\lambda G(R_i)+\alpha[1-G(R_o)]]}$. The optimal wage is chosen such that the marginal utility gain equals the marginal utility loss. Rearranging allows us to restate this equation as

$$[r + \lambda G(R_i) + \alpha[1 - G(R_o)]] = [\omega - b] \cdot \underbrace{\left[\lambda g(R_i)\frac{dR_i}{d\omega} - \alpha g(R_o)\frac{dR_o}{d\omega}\right]}_{=d(JR)/d\omega}. \tag{12}$$

Substituting of equation (10) and solving for ω gives us

$$\omega = b + \frac{[r + \lambda G(R_i)][r + \lambda G(R_i) + \alpha[1 - G(R_o)]]}{(r + \lambda)[\lambda g(R_i) - \alpha g(R_o)]} \tag{13}$$

as the optimal wage chosen by the union. Equation (13) states that each worker must obtain the reservation income of an unemployed worker (unemployment benefits per period, b) plus some extra charge of working, $\frac{[r+\lambda G(R_i)][r+\lambda G(R_i)+\alpha[1-G(R_o)]]}{(r+\lambda)[\lambda g(R_i)-\alpha g(R_o)]}$.

For tractability and analytical convenience, we assume a uniform productivity distribution for $x \in [0, 1]$, which yields $G(x) = x$, $g(x) = 1$, $g'(x) = 0$. This eliminates the indirect wage effect resulting from a more general distribution function. Nevertheless, the results derived below are unambiguously amplified for a Pareto or an exponential distribution (see Appendix B), which are more commonly used as they well approximate log-density of productivity on labor markets (see Axtell, 2001, Helpman et al., 2004 or Felbermayr and Prat, 2007). The uniform distribution, however, keeps the mathematics simpler. Equation (13) can be re-written as

$$\omega = b + \frac{[r + \lambda R_i][r + \lambda R_i + \alpha(1 - R_o)]}{(r + \lambda)(\lambda - \alpha)}. \tag{14}$$

This shows that the wage increases with increasing dismissal probability, pictured by an increase in R_i, to compensate for the risk of job loss, while it decreases with decreasing re-employment chances, describable by an increase in R_o.

Substituting the union wage, equation (14), into the firm-level job destruction and job creation conditions, equations (8) and (9), and taking into account the uniform distribution function, $\int_{R_i}^1 (x-R_i)dG(x) = \frac{1}{2}(1-R_i)^2$, the market equilibrium conditions for job destruction (hereinafter JD) and job creation (hereinafter JC) can be stated as

$$R_i - t + \frac{1}{2}\frac{\lambda}{r + \lambda}(1 - R_i)^2 = b + \frac{[r + \lambda R_i][r + \lambda R_i + \alpha(1 - R_o)]}{(r + \lambda)(\lambda - \alpha)} - rT, \tag{15}$$

[6] Note that dismissal probability is given by $\lambda G(R_i)$, whereas (re-)employment chances are given by $\alpha[1 - G(R_o)]$ in equilibrium. Hence, the JR is given by $\lambda G(R_i) + \alpha[1 - G(R_o)]$, i.e. the rate of employed workers becoming unemployed plus the rate of unemployed workers finding employment. Changing the wage claim, ω, changes the dismissal and (re-)employment probability and, hence, the JR.

and

$$R_o - t + \frac{1}{2}\frac{\lambda}{r+\lambda}(1-R_i)^2 = b + \frac{[r+\lambda R_i][r+\lambda R_i+\alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)} + \lambda T, \tag{16}$$

respectively. From equations (15) and (16), we see that both, the JD and the JC are positively sloped in a (R_i/R_o) space.[7]

The interpretation of the JC is simple. For a pair (R_i, R_o) on the JC curve, where $J(R_o) = 0$, a marginal increase in insider reservation productivity, R_i, reduces the expected gains from a new realization of the idiosyncratic shock which occurs at rate λ and makes the outsider job value negative. To remain on the curve it is necessary to increase outsider reservation productivity, R_o, in order to compensate this expected loss. The rise in R_o has a direct impact on the marginal (newly created) job's productivity and an indirect impact through a reduction in the wage via a decline in the worker's outside option rU.

The positive slope of the JD is due to the positive feedback between the wage, ω, and insider reservation productivity, R_i. For a pair (R_i, R_o) on the JD curve, where $J(R_i) = -T$, a decrease in R_o (yielding better re-employment chances) increases the wage through its positive effect on the worker's outside option rU and reduces the value of the marginal job. To restore the JD, it is necessary to augment the value of the job for the firm. Therefore jobs are dissolved at a higher productivity level, R_i, *ceteris paribus*. This, however, generates a rise in the union wage (equation (14)) which overcompensates the increase of the value of the job for the firm. Thus, owing to the unionized wage setting, R_i must be decreased in order to restore the JD, which explains the positive slope.

Proposition 1 *Stability exists for $\lambda > \alpha$.*

Proof. Concerning stability, we know that if the Jacobi matrix of the system of equations (15) and (16) is negative, the resulting equilibrium (for any given level of T and t) is stable. The Jacobi matrix can be derived as

$$D = \frac{-\lambda(r+\lambda R_i) - \lambda\alpha(1-R_o)}{(r+\lambda)(\lambda-\alpha)}.$$

We see that $D < 0$ for $\lambda > \alpha$. Further, equation (12) would be without solution (or imply a wage smaller than unemployment benefits) otherwise. ∎

We further assume that $\lambda > \alpha$ in order to concentrate on the situations with stable equilibria. Following Definition 1, simultaneously solving equations (15) and (16), and equations (5) and (6) determines the equilibrium values for insider and outsider reservation productivity, R_i and R_o, as well as the equilibrium unemployment rate and the necessary employment tax, t, for a given level of dismissal taxes, T.

[7] For a situation in which the JD's slope exceeds the JC's slope, a steady-state equilibrium may exist. However, no out-of-equilibrium situation converges to equilibrium. The same holds true whenever an exogenous change implies an upward shift of the JD and, correspondingly, a downward shift of the JC (or vice versa); the new steady state will not be reached and, hence, the equilibrium is unstable. This issue is discussed in more detail in Stähler (2007). We will derive conditions for a stable equilibrium below.

From equations (15) and (16), another important observation we can make is that if the unemployment insurance is solely financed through employment taxes, t (which implies $T = 0$), insider and outsider reservation productivity are equal, $R_i = R_o$. According to the equilibrium conditions, Definition 1, the JC and the JD are equal for $T = 0$, $J_i(R_i) = J_o(R_o) = 0$ and, hence, imply the same reservation productivity, no matter if the job is newly created or already exists as no dismissal costs apply and wages are the same.

3 Employment Effects Through Experience Rating

The following section deals with the question of what happens if dismissal taxes become more important in financing the unemployment insurance in the presence of unionized wage bargaining. The analysis more or less follows Baumann and Stähler (2006). Differentiating the JD and the JC, equations (15) and (16), yields

$$-\frac{(\lambda+\alpha)(r+\lambda R_i)+\lambda\alpha(1-R_o)}{(r+\lambda)(\lambda-\alpha)}dR_i+\frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)}dR_o=-rdT+dt, \tag{17}$$

and

$$\begin{aligned} - & \quad \frac{\lambda[(\lambda-\alpha)+2r+(\lambda+\alpha)R_i+\alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)}dR_i \\ + & \quad \left[1+\frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)}\right]dR_o=\lambda dT+dt. \end{aligned} \tag{18}$$

We see in equation (17) that insider reservation productivity, i.e. dismissal probability, *ceteris paribus* rises with increasing dismissal taxes, T, and increasing outsider reservation productivity, R_o, whereas it decreases with falling employment taxes, t. Outsider reservation productivity *ceteris paribus* increases with rising dismissal taxes, T, insider reservation productivity, R_i, and employment taxes, t, as equation (18) shows.

The effects on outsider reservation productivity are easily explained. Higher dismissal taxes as well as higher employment taxes increase (expected) labor costs (due to higher direct taxation or indirect taxation connected to a layoff) and, hence, decrease the value of a job. Analogously, a higher insider reservation probability shortens the average duration of a job. This implies that the incentive for job creation decreases.

The effects on insider reservation productivity are a bit odd at first sight. Neglecting the wage effect for a moment, we see that an increase of dismissal taxes, T, decreases dismissal probability, whereas an increase of employment taxes, t, raises dismissal probability.[8] This is quite intuitive as a rise in dismissal taxes makes layoffs more expensive, whereas a rise in employment taxes increases labor costs. Taking into account the wage effect, we see that, due to the reduced insider reservation productivity, the union's wage claim falls by

[8] To see this, we totally differentiate equation (8) which yields $\frac{r+\lambda R_i}{r+\lambda}dR_i = d\omega + dt - rdT$.

$\frac{2(r+\lambda R_i)+\alpha(1-R_o)}{(r+\lambda)(\lambda-\alpha)}$ (see equation (14)). This wage reduction overcompensates the decrease of the value of the job, $\frac{r+\lambda R_i}{r+\lambda}$ (see equation (8)) which, in total, implies an increase in the value of a job, not complying with the JD. Hence, insider reservation productivity must rise along with dismissal taxes in order to restore the job destruction condition. An analogous argument can be made for the effects resulting from an increase in employment taxes, t. The positive relationship between insider and outsider reservation productivity on the JD has already been explained in section 2.

In order to analyze the total economic effects of an increase in dismissal taxes, T, one must take into account that the government adapts employment taxes, t, in order to achieve a balanced budget. Differentiating the budget constraint, equation (6), and using the uniform distribution function, we obtain

$$dt = \frac{b}{(1-u)^2}du - \lambda R_i dT - \lambda T dR_i. \tag{19}$$

This shows that *ceteris paribus* an increase in the unemployment rate, u, and an increase in the dismissal probability, indicated by an increase in the insider reservation productivity, R_i, increases the required employment tax, t, while an increase in the dismissal taxes, T, decreases the employment tax needed to balance the budget.

Differentiating equation (5) yields

$$du = \frac{\lambda\alpha[1-R_o]}{[\lambda R_i + \alpha[1-R_o]]^2}dR_i + \frac{\alpha\lambda R_i}{[\lambda R_i + \alpha[1-R_o]]^2}dR_o. \tag{20}$$

By substituting the decomposed unemployment effect, equation (20), and $\frac{\alpha^2[1-R_o]^2}{[\lambda R_i+\alpha[1-R_o]]^2} = (1-u)^2$ (see equation (5)) into equation (19), we get

$$dt = \left\{\frac{b}{\alpha[1-R_o]} - T\right\}\lambda dR_i + b\frac{\lambda R_i}{\alpha(1-R_o)^2}dR_o - \lambda R_i dT. \tag{21}$$

This shows that employment taxes, t, decrease with an increase in dismissal taxes, T, (through the direct financing effect) and decreases with increasing job creation (decreasing outsider reservation productivity, R_o). An increase in the dismissal probability has two opposite effects. On the one hand, employment taxes have to rise, as an increase in insider reservation productivity *ceteris paribus* increases unemployment (captured by the term $\frac{b}{\alpha[1-R_o]}$ which represents the average costs per unemployed worker).[9] On the other hand, increasing dismissal probability (increase in insider reservation productivity) may decrease the employment tax as the tax base for the dismissal taxes, T (the average number of dismissals), changes. We can, however, conclude that, as long as the unemployment insurance is not yet

[9] Note that b represents the unemployment benefits that have to be paid each period and $\frac{1}{\alpha[1-R_o]}$ is the average duration of unemployment in the steady state.

fully financed through dismissal taxes, i.e. the average costs of an unemployed worker exceed the dismissal taxes ($\frac{b}{\alpha[1-R_o]} > T$), employment taxes, t, increase with increasing job destruction probability (see also Baumann and Stähler, 2006).

Substituting equation (21) into equations (17) and (18), with some rearranging (see Appendix A), yields

$$\frac{dR_i}{dT} = -\frac{(r+\lambda)}{\widetilde{D}} \left\{ \frac{\lambda(r+\lambda R_i)}{(\lambda-\alpha)(r+\lambda)} - b \underbrace{\frac{\lambda R_i}{\alpha(1-R_o)^2}}_{=dt/dR_o} \right\}, \tag{22}$$

$$\frac{dR_o}{dT} = -\frac{(r+\lambda)}{\widetilde{D}} \left\{ \lambda \left[\frac{b}{\alpha(1-R_o)} - T \right] + \frac{\lambda[2(r+\lambda R_i) + \alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)} \right\} > 0, \tag{23}$$

where

$$\begin{aligned} \widetilde{D} \;=\; & -\frac{\lambda[(r+\lambda R_i) + \alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)} - b\frac{\lambda R_i}{\alpha(1-R_o)^2} \\ & -\lambda \left[\frac{b}{\alpha(1-R_o)} - T \right] < 0. \end{aligned} \tag{24}$$

Equation (24) shows that $\widetilde{D} < 0$ for $\lambda > \alpha$ and, as long as unemployment insurance is not yet fully financed by dismissal taxes, $\frac{b}{\alpha(1-R_o)} > T$. This implies that outsider reservation productivity, R_o, increases with increasing dismissal taxes according to equation (23). From equation (22) we see that the effect on insider reservation productivity, i.e. dismissal probability, is ambiguous.

Again, we start off by describing the incentives for job creation, as they are easier to assess. Due to the increase in dismissal taxes, T, the expected labor costs increase, which reduces the incentive for job creation. This incentive may be diminished by the *potential* decrease in insider reservation productivity (see equation (22)) and/or the *potential* decrease in employment taxes (see equation (21)). As becomes obvious in equation (23), this does not compensate the negative effects on the incentive for job creation which, therefore, unambiguously decreases due to a rise in dismissal taxes (i.e. outsider reservation productivity increases).

The effect of an increase in dismissal taxes, T, on insider reservation productivity can be explained as follows. Disregarding the wage effect, augmenting T *ceteris paribus* reduces dismissal probability and job creation, as firing a worker is now more expensive. This reduces labor reallocation but raises the union's marginal utility loss due to higher wages stemming from discounting, $d(JR)/d\omega = \lambda(dR_i/d\omega) - \alpha(dR_o/d\omega)$ (see equation (10)). This would *ceteris paribus* result in a lower wage claim and lower the union's utility.[10] As the union sets

[10]By totally differentiating equations (8) and (9) and following Appendix A, it is straightforward to show

wages before firms determine insider and outsider reservation productivity, it can implicitly determine dismissal and re-employment probabilities. Anticipating the potential utility loss, the union forces firms to heighten the dismissal probability to comply with the JD through its wage setting behavior as described above in equation (17). The resulting wage increase overcompensates the rise in dismissal taxes and generates the incentive to increase the dismissal probability which is formally captured by the term $\frac{\lambda(r+\lambda R_i)}{(\lambda-\alpha)(r+\lambda)}$ in equation (22). Contrary to this effect, we see in equation (22) that the increase in employment taxes due to the increase in outsider reservation productivity, dt/dR_o (which *ceteris paribus* increases unemployment and therefore generates additional financial needs for the unemployment insurance, see also equation (21)), generates the incentive to decrease dismissal probability as described in equation (17), again due to the additional wage effect.

It remains an empirical question which of the effects dominates. When insider reservation productivity increases, unemployment unambiguously increases with a rise in dismissal taxes due to more layoffs and less job creation. In the event it decreases, the effects on the unemployment rate are ambiguous, as there are fewer dismissals and less job creation (see equation (20)). The latter holds true for $T > 0$, which implies that experience rating already exists in the economy and the importance of dismissal taxes for the financing of the unemployment insurance is reinforced.

Substituting equations (22) and (23) into equation (20) yields

$$\begin{aligned}\frac{du}{dT} &= -\frac{(r+\lambda)\alpha\lambda}{[\lambda R_i + \alpha(1-R_o)]^2 \widetilde{D}} \left\{ (1-R_o)\frac{\lambda(r+\lambda R_i)+\lambda\alpha R_i}{(r+\lambda)(\lambda-\alpha)} \right. \\ &\quad \left. + 2\lambda R_i \frac{(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)} - \lambda R_i T \right\}. \qquad (25)\end{aligned}$$

We see from equation (25) that, when experience rating is initially implemented (i.e. $T = 0$ initially), unemployment unambiguously increases. This shows that the introduction of an experience rated unemployment insurance unambiguously increases unemployment, no matter what happens with insider reservation productivity. Even if dismissal probability decreases due to an higher dismissal taxes, this reduction is overcompensated by the resulting decrease in job creation.

4 Conclusion

In this paper, we have shown that policy makers interested in reducing the unemployment rate in Europe might have been right not to introduce an experience rated unemployment insurance system. This contradicts many theoretical findings in labor market analysis which suggest that experience rating indeed decreases unemployment.

that, neglecting the wage effect, $\frac{dR_i}{dT} = -\frac{r(r+\lambda)}{r+\lambda R_i} < 0$ and $\frac{dR_o}{dT} = \frac{(r+\lambda)^2}{r+\lambda R_i} > 0$. Substituting the optimal wage, equation (14), into the union's utility function, equation (7), it is easy to see that the utility decreases with decreasing changes in job reallocation resulting from wage increases.

The reason is that those findings basically assume individual wage bargaining between workers and firms. European labor markets are, however, highly unionized. To integrate unions, we have assumed an insider-dominated monopoly union that maximizes the gain from employment over unemployment and sets a wage binding for all workers and firms.

Raising dismissal taxes *ceteris paribus* reduces job destruction and creation. As this results in a decrease in job reallocation and, hence, an increase of the union's marginal utility loss due to higher wages (following from discounting), the union's utility decreases. However, the union determines its optimal wage claim before firms determine job creation and job destruction conditions. In anticipation of the potential utility loss, the optimal wage setting behavior forces firms to increase job destruction when dismissal taxes are increased and, thus, implies disproportionately higher wages at the end. In total, this unambiguously results less job creation as higher wages plus additional firing costs cannot be compensated by a potential decrease in employment taxes.

Higher dismissal taxes create ambiguous effects on job destruction, however. On the one hand, dismissals get more expensive (reducing dismissal probability). On the other hand, wages increase whereas employment taxes potentially decrease (which is itself ambiguous). If the wage effect is strong enough, dismissal probability may increase as well. This implies a rise in unemployment. Otherwise, job destruction decreases, yielding ambiguous employment effects due to less job creation and fewer dismissals. In principle, it remains an empirical question which effect dominates.

It can, however, be shown that, if an experience rated unemployment insurance is introduced (i.e. introducing dismissal taxes to an insurance that solely is financed by employment taxes initially), the reduction of job creation always dominates the potential decrease in dismissal probability and unemployment unambiguously rises.

We should address some limitations of the above analysis. First, the results are derived for a uniform productivity distribution but unambiguously hold for a Pareto or exponential distribution as well. For normally distributed productivity, the results tend to be ambiguous as there are additional effects that may reduce the wage increase described. Second, the union's utility function chosen does indeed partly drive the results. A different and more common utility function such as the utilitarian, does again produce wage effects in the opposite direction which may possibly compensate the effects described here. It then remains an empirical question which effect dominates as a clear analytical solution of the problem then becomes impossible. These shortcomings are left for further research.

Appendix

A Calculating the Overall Effect in the Presence of Unionized Wage Bargaining

Totally differentiating equations (15) and (16) yields equations (17) and (18). Substituting equation (21) and writing these equations as a matrix yields

$$\underbrace{\begin{pmatrix} -\frac{(\lambda+\alpha)(r+\lambda R_i)+\lambda\alpha(1-R_o)}{(r+\lambda)(\lambda-\alpha)} - \left[\frac{b}{\alpha(1-R_o)} - T\right] & \frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)} - b\frac{\lambda R_i}{\alpha(1-R_o)^2} \\ -\frac{\lambda[(\lambda-\alpha)+2r+(\lambda+\alpha)R_i+\alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)} - \left[\frac{b}{\alpha(1-R_o)} - T\right] & \left[1+\frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)} - b\frac{\lambda R_i}{\alpha(1-R_o)^2}\right] \end{pmatrix}}_{=B} \times \begin{pmatrix} dR_i \\ dR_o \end{pmatrix} = \begin{pmatrix} -(r+\lambda R_i) \\ \lambda(1-R_i) \end{pmatrix} dT. \tag{26}$$

With $\widetilde{D} = det(B)$, which gives the Jacobi-matrix, equation (24), rearranging equation (26) yields

$$\begin{pmatrix} dR_i \\ dR_o \end{pmatrix} = \frac{1}{\widetilde{D}} \cdot \begin{pmatrix} \left[1+\frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)} - b\frac{\lambda R_i}{\alpha(1-R_o)^2}\right] & -\frac{\alpha(r+\lambda R_i)}{(r+\lambda)(\lambda-\alpha)} + b\frac{\lambda R_i}{\alpha(1-R_o)^2} \\ \frac{\lambda[(\lambda-\alpha)+2r+(\lambda+\alpha)R_i+\alpha(1-R_o)]}{(r+\lambda)(\lambda-\alpha)} + \left[\frac{b}{\alpha(1-R_o)} - T\right] & -\frac{(\lambda+\alpha)(r+\lambda R_i)+\lambda\alpha(1-R_o)}{(r+\lambda)(\lambda-\alpha)} - \left[\frac{b}{\alpha(1-R_o)} - T\right] \end{pmatrix} \times \begin{pmatrix} -(r+\lambda R_i) \\ \lambda(1-R_i) \end{pmatrix} dT. \tag{27}$$

After some rearranging, equation (27) gives equations (22) and (23).

B The Effects with More General Distribution Functions

As already mentioned, some of the results presented in the paper are based on the assumption of a uniform productivity distribution and, hence, a correspondingly large wage effect. With a more general distribution function, the wage effect is different. Differentiating equation (13) with respect to insider and outsider reservation productivity, respectively, yields

$$\begin{aligned}\frac{d\omega}{dR_i} &= \lambda g(R_i)\frac{2[r+\lambda G(R_i)]+\alpha[1-G(R_o)]}{(r+\lambda)[\lambda g(R_i)-\alpha g(R_o)]} \\ &- \lambda g'(R_i)\frac{[r+\lambda G(R_i)][r+\lambda G(R_i)+\alpha[1-G(R_o)]]}{(r+\lambda)[\lambda g(R_i)-\alpha g(R_o)]^2} \end{aligned} \quad (28)$$

and

$$\begin{aligned}\frac{d\omega}{dR_o} &= -\alpha g(R_o)\frac{[r+\lambda G(R_i)]}{(r+\lambda)[\lambda g(R_i)-\alpha g(R_o)]} \\ &+ \alpha g'(R_o)\frac{[r+\lambda G(R_i)][r+\lambda G(R_i)+\alpha[1-G(R_o)]]}{(r+\lambda)[\lambda g(R_i)-\alpha g(R_o)]^2}. \end{aligned} \quad (29)$$

It is easy to see that the first terms on the rhs of equations (28) and (29) correspond to the changes with a uniform distribution function calculated in the main text and, thus, yield the same implications. However, there is an additional wage effect with a more general distribution function. This is captured by the second terms on the rhs of equations (28) and (29). Whether these terms are negative or positive depends to a great extent on the properties of the density function at reservation productivity R_i and R_o, respectively. If $g'(R_k) < 0$, the results presented in the main text are amplified. For a normally distributed productivity, for example, this is the case if $R_k > \mu$, where μ is the expected value of productivity. If $g'(R_k) > 0$, however, the wage increase (or decrease) achieved in the main text is lessened by the second terms on the rhs of equations (28) and (29). If this second effect dominates the first effect, wages decrease as the dismissal probability increases and increase in line with job creation. Then, it is a straightforward matter to show that an increase in dismissal costs leads to the results found in conventional literature, i.e. a decrease in job destruction and job creation and, hence, ambiguous effects on unemployment. If the first effect dominates (as is unambiguously the case with a uniform distribution), the results in the main text can be qualitatively reached even with a more general distribution function. This unambiguously holds true for more general and more commonly used productivity distributions such as exponential or Pareto as then, $g'(R_k) < 0$. Axtell (2001), Helpman et al. (2004) or Felbermayr and Prat (2007) argue that the log-density and firms' log-size are well approximated by such affine distribution functions. For the more general form of these types of distribution functions, like the Gamma or Beta distribution, we could derive sufficient conditions in terms of distribution parameters for the results in the main text to hold.

C The Model of Baumann and Stähler (2006)

In this section, wages are bargained individually between workers and firms. The bargaining power of workers is $0 < \beta < 1$. We assume that wages are renegotiated in the case of a shock. When bargaining over wages in existing jobs, $w_i(x)$, the fall-back position of the firm is given by the (negative) dismissal tax T that has to be paid in the case of a layoff, whereas the worker's fall-back position is given by the utility of unemployment, U. If workers and firms bargain over initial wages, $w_o(x)$, the firms' fall-back position is zero (which is the steady-state value of a vacancy). Hence, we obtain the two-tier wage contract solving

$$w_i(x) = \arg\max \left(W_i(x) - U\right)^{\beta} \left(J_i(x) + T\right)^{1-\beta}, \tag{30}$$

$$w_o(x) = \arg\max \left(W_o(x) - U\right)^{\beta} J_o(x)^{1-\beta}. \tag{31}$$

The maximization problems given by the two last equations yield the sharing rules $(1 - \beta)[W_i(x) - U] = \beta[J_i(x) + T]$ and $(1 - \beta)[W_o(x) - U] = \beta J_o(x)$, respectively. Substituting equations (2) to (4) into those sharing rules, the wages turn out to be[11]

$$w_i(x) = \beta \left(x - t + rT + \frac{\alpha}{r+\lambda} \int_{R_o}^{1} (x - R_o) dG(x) \right) + (1 - \beta) b, \tag{32}$$

$$\begin{aligned} w_o(x) &= \beta \left(x - t - \lambda T + \frac{\alpha}{r+\lambda} \int_{R_o}^{1} (x - R_o) dG(x) \right) + (1 - \beta) b \\ &= w_i(x) - \beta(r + \lambda) T. \end{aligned} \tag{33}$$

For given policy parameters, the market equilibrium is determined by the reservation productivity for outsiders, R_o (as a measure for job creation) and the reservation productivity for insiders, R_i (as a measure for job destruction). The latter is determined by the job destruction condition that the worker will be dismissed if the value of the firm falls below the negative dismissal tax as point 3 of Definition 1. Using equations (2) and (32) and following Pissarides (2000), we can derive

$$R_i - t + \frac{\lambda}{r+\lambda} \int_{R_i}^{1} (x - R_i) dG(x) = b + \frac{\beta}{(1-\beta)} \frac{\alpha}{r+\lambda} \int_{R_o}^{1} (x - R_o) dG(x) - rT \tag{34}$$

as the job destruction condition (further JD). Analogously, we can derive

$$R_o - t + \frac{\lambda}{r+\lambda} \int_{R_i}^{1} (x - R_i) dG(x) = b + \frac{\beta}{(1-\beta)} \frac{\alpha}{r+\lambda} \int_{R_o}^{1} (x - R_o) dG(x) + \lambda T \tag{35}$$

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[11] Wages turn out to be $w_i(x) = \beta[x - t + rT] + (1-\beta) rU$ and $w_o(x) = \beta[x - t - \lambda T] + (1-\beta) rU$, respectively. To eliminate U, we make use of $(1-\beta)[W_o(x) - U] = \beta J_o(x)$ and $(r+\lambda)[J_o(x) - J_o(R_o)] = (1-\beta)(x - R_o)$, with $J_o(R_o) = 0$. Substituting this into equation (4) yields $rU = b + \frac{\alpha\beta}{(1-\beta)(r+\lambda)} \int_{R_o}^{1} (x - R_o) dG(x)$. Substituting rU into the just mentioned wage equations and rearranging finally leads to equations (32) and (33). Note that these wages are perfectly equivalent to those derived in Baumann and Stähler (2006), where the term $\frac{\alpha}{r+\lambda} \int_{R_o}^{1} (x - R_o) dG(x)$ is equivalent to the market tightness term. A detailed discussion about the two-tier wage contract is found there or in Mortensen and Pissarides (2003) and will be skipped here.

as the job creation condition (further JC) when using equations (2) and (33) and point 2 of Definition 1. Hence, the equilibrium is determined by equations (34), (35), (5) and (6).

To derive the effects of an experience rated unemployment insurance, i.e. an increase of dismissal taxes, T, we follow Baumann and Stähler (2006). Totally differentiating equation (6) yields

$$dt = \frac{b}{(1-u)^2} du - \lambda G(R_i) dT - \lambda g(R_i) T dR_i. \tag{36}$$

This shows that *ceteris paribus* an increase in the unemployment rate, u, and an increase in the dismissal probability, indicated by an increase in the insiders' reservation productivity, R_i, causes the required employment tax, t, to rise, while an increase in the dismissal taxes, T, decreases the employment tax for a balanced budget.

Differentiating equation (5) yields

$$du = \frac{\lambda g(R_i)\alpha[1-G(R_o)]}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2} dR_i + \frac{\alpha g(R_o)\lambda G(R_i)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2} dR_o. \tag{37}$$

By substituting the decomposed unemployment effect, equation (37), and $\frac{\alpha^2[1-G(R_o)]^2}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2} = (1-u)^2$ (see equation (5)) into equation (36), we obtain

$$\begin{aligned} dt &= \left\{ \frac{b}{\alpha[1-G(R_o)]} - T \right\} \lambda g(R_i) dR_i \\ &\quad + \frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2} dR_o - \lambda G(R_i) dT. \end{aligned} \tag{38}$$

This shows that employment tax, t, decreases with an increase of dismissal taxes, T, (through the direct financing effect) and decreases with increasing job creation (decreasing outsider reservation productivity, R_o) as there is *ceteris paribus* less unemployment. An increase in the dismissal probability has two opposite effects. On the one hand, employment taxes have to increase, as an increase in insider reservation productivity *ceteris paribus* increases unemployment (captured by the term $\frac{b}{\alpha[1-G(R_o)]}$ which represents the average costs per unemployed worker). On the other hand, increasing dismissal probability (increase in insider reservation productivity) may decrease the employment tax as the tax base for the dismissal taxes, T, (the average number of dismissals) increases. We can, however, conclude that, as long as the unemployment insurance is not yet fully financed through dismissal taxes, i.e. the average costs of an unemployed worker exceed the dismissal taxes ($\frac{b}{\alpha[1-G(R_o)]} > T$), employment taxes, t, increase with increasing job destruction probability (see also Baumann and Stähler, 2006).

To analyze the reaction of job destruction and job creation and, hence, unemployment to an increase in dismissal taxes, T, we totally differentiate equations (34) and (35) and substitute equation (38) for dt. This yields[12]

$$\begin{aligned}
- & \left\{\frac{r+\lambda G(R_i)}{r+\lambda} - \left[\frac{b}{\alpha[1-G(R_o)]} - T\right]\lambda g(R_i)\right\} dR_i \\
& - \left\{\frac{\beta}{1-\beta}\frac{\alpha}{r+\lambda}[1-G(R_o)] - \frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2}\right\} dR_o \\
& = \{r+\lambda G(R_i)\} dT \qquad (39)
\end{aligned}$$

and

$$\begin{aligned}
& \left\{-\frac{\lambda}{r+\lambda}[1-G(R_i)] - \left[\frac{b}{\alpha[1-G(R_o)]} - T\right]\lambda g(R_i)\right\} dR_i \\
& + \left\{1 + \frac{\beta}{1-\beta}\frac{\alpha}{r+\lambda}[1-G(R_o)] - \frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2}\right\} dR_o \\
& = \lambda[1-G(R_i)]dT. \qquad (40)
\end{aligned}$$

Using equations (39) and (40) we can then further derive

$$\begin{aligned}
\frac{dR_i}{dT} &= \frac{(r+\lambda)}{Q}\left\{\underbrace{\frac{r+\lambda G(R_i)}{r+\lambda} + \frac{\beta}{1-\beta}\frac{\alpha}{(r+\lambda)}[1-G(R_o)]}_{=-D}\right. \\
& \left. -\frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2}\right\}, \qquad (41)
\end{aligned}$$

$$\frac{dR_o}{dT} = \frac{1}{Q}\left\{\left[\frac{b}{\alpha[1-G(R_o)]} - T\right](r+\lambda)\lambda g(R_i)\right\}, \qquad (42)$$

where

$$Q = D + \left[\frac{b}{\alpha[1-G(R_o)]} - T\right]\lambda g(R_i) + \frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i)+\alpha[1-G(R_o)]]^2}, \qquad (43)$$

with $D = -\frac{r+\lambda G(R_i)}{r+\lambda} - \frac{\beta}{(1-\beta)}\frac{\alpha}{(r+\alpha)}[1-G(R_o)] < 0$. From equation (42) it is obvious that outsider reservation productivity, R_o, decreases (i.e. job creation increases) with an increase in dismissal taxes, T, as long as $Q < 0$ and the unemployment insurance is not yet fully financed through dismissal taxes, $\frac{b}{\alpha[1-G(R-o)]} > T$. $Q < 0$ if the unemployment insurance is located on the upward sloping part of the Laffer curve regarding employment taxes, t, (see Appendix D) as in Baumann and Stähler (2006). It is straightforward to see that the

[12]Totally differentiating equation (34) yields $-\frac{r+\lambda G(R_i)}{r+\lambda}dR_i - \frac{\beta}{(1-\beta)}\frac{\alpha}{r+\lambda}[1-G(R_o)]dR_o = rdT - dt$. From differentiating equations (35), we get $-\frac{\lambda}{r+\lambda}[1-G(R_i)]dR_i + \left\{1 + \frac{\beta}{(1-\beta)}\frac{\alpha}{r+\lambda}[1-G(R_o)]\right\}dR_o = \lambda dT + dt$, which then gives a downward sloping JD and an upward sloping JC curve in the (R_i/R_o) space. Substituting equation (38) to eliminate dt and rearranging yields equations (39) and (40).

term in brackets of equation (41) is greater than zero as long as $Q < 0$. Hence, insider reservation productivity decreases with increasing dismissal taxes and, thus, yields fewer dismissals. Equation (5) shows that unemployment unambiguously decreases due to fewer dismissals and higher job creation.

By briefly sketching the mechanism at work, we can decompose the effect into three components. An increase in dismissal taxes, T, leads to a direct financing effect through substituting those taxes with employment taxes, t. But employment taxes, t, and dismissal taxes, T, cannot be fully substituted, as higher dismissal taxes yield fewer dismissals and generate the tax base effect described in equation (38). Hence, employment taxes need to stay higher than would be implied by a full substitution. However, as is also obvious in equation (38), higher dismissal taxes decrease the financing requirements of the unemployment insurance system due to fewer dismissals so that employment taxes can be reduced by more than is implied by a full substitution. The latter effect dominates the tax base effect as long as the conditions just derived - $Q < 0$ and $\frac{b}{\alpha[1-G(R-o)]} > T$ - hold. This results in a decrease in the firms' total tax burden, hence, reducing labor costs and unemployment. For a more detailed description, see Baumann and Stähler (2006). As the results are perfectly identical, it has been shown that the different matching process does not matter.

D Sign of Q

To prove that $Q < 0$ as long as the unemployment insurance is located on the upward sloping part of the Laffer curve, we follow Baumann and Stahler (2006, Appendix C). In the event of a balanced budget, equation (6) can be redefined as

$$A = (1-u)[t + \lambda G(R_i)T] - bu = 0. \tag{44}$$

Totally differentiating A with respect to t and using equation (44) to simplify yields

$$\begin{aligned} \frac{dA}{dt} &= (1-u) - [t + \lambda G(R_i)T + b]\frac{du}{d} + (1-u)\lambda g(R_i)\frac{dR_i}{dt} \\ &= (1-u) - \frac{A+b}{(1-u)}\frac{du}{dt} + (1-u)\lambda g(R_i)\frac{dR_i}{dt} \\ &= (1-u)\left\{1 - \frac{b}{(1-u)^2}\frac{du}{dt} + \lambda g(R_i)\frac{dR_i}{dt}\right\} - \underbrace{\frac{A}{(1-u)}}_{=0}. \end{aligned} \tag{45}$$

From equation (44), we know that, because the budget is initially balanced, $A = 0$. Substituting equation (37), for du/dt, we can derive

$$\begin{aligned} \frac{dA}{dt} = (1-u)\Bigg\{1 - \left[\frac{b}{\alpha[1-G(R_o)]} - T\right]\lambda g(R_i)\frac{dR_i}{dt} \\ -\frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i) + \alpha[1-G(R_o)]]^2}\frac{dR_o}{dt}\Bigg\}. \end{aligned} \tag{46}$$

From the totally differentiated job destruction and job creation condition as presented in footnote 12, we know that

$$\frac{dR_i}{dt} = \frac{dR_o}{dt} = -\frac{1}{D} > 0,$$

where $D = -\frac{r+\lambda G(R_i)}{r+\lambda} - \frac{\beta}{(1-\beta)} \frac{\alpha}{(r+\lambda)}[1-G(R_o)] < 0$. Substituting this into equation (46) yields

$$\begin{aligned} \frac{dA}{dt} &= \frac{(1-u)}{D}\left\{D + \left[\frac{b}{\alpha[1-G(R-o)]} - T\right]\lambda g(R_i) \right. \\ &\quad \left. + \frac{\lambda G(R_i)\alpha g(R_o)}{[\lambda G(R_i) + \alpha[1-G(R_o)]]^2}\right\} \\ &= \frac{(1-u)}{D}Q. \end{aligned} \tag{47}$$

So, if an increase of employment taxes, t, increases the surplus of the unemployment insurance (it is located on the upward sloping part of the Laffer curve with respect to employment taxes), $dA/dt > 0$, Q must be negative, as $D < 0$.

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