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Unemployment insurance and the business cycle: Prolong benefit entitlements in bad times?

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Abstract:

The aim of this paper is to study the optimal duration of unemployment benefit entitlement duration across the business cycle. We wonder if the entitlement duration should be prolonged in bad and shortened in good times. Because of consumption smoothing, such a countercyclical policy can be welfare-enhancing as long as it does not affect labor market adjustment too severely or even helps to reduce inefficiencies there. If, however, the labor market is quite inflexible already, procyclical behavior may be preferable. In a calibrated dynamic business cycle framework, we find that countercyclical benefit entitlement duration may be preferable in the US but not in Europe.

Keywords: unemployment insurance, entitlement duration, business cycle.

JEL code: E 32, G 61, E 62.

Non-technical summary

As unemployment is expected to rise significantly during the current recession, it was suggested to make entitlement duration for unemployment benefits dependent on the current cyclical situation, implying to prolong them in recessions. In this paper, we analyze the effects of such a policy on employment and welfare. For this purpose, we use a Real Business Cycle model with a frictional labor market.

In the theoretical part of the paper, we differentiate between two different types of unemployment benefits: After being dismissed, a worker is entitled to receive premium benefits, which are decreased in the course of unemployment. We then assess the labor market and welfare effects of prolonging entitlement duration for premium benefits in times of a recession. Such a policy yields an increase in the workers' reservation utility and, thus, wages, which implies a decrease in employment and production. However, such a policy may imply consumption smoothing as households are potentially able to consume more during recessions. By itself, this increases welfare. It is, however, not clear from a theoretical perspective which of the two effects, i.e. the weaker labor market adjustment or the desire for consumption smoothing, dominates.

Calibrating the model to US and European data may, thus, be enlightening. We find that the existence of a rather flexible and employer-friendly labor market yields fairly small negative labor market effects, while they are comparably large for a rather inflexible and employee-friendly labor market. For the latter, our analysis even suggests a procyclical policy – implying shortening of the entitlement duration in bad times. Hence, our analysis suggests to countercyclically adapt entitlement duration for unemployment benefits – i.e. increasing it in the current situation – for the US, which are characterized by flexible labor markets, while, for Europe, there should be a procyclical stance.

Furthermore, we analyze some extensions to check the robustness of our results to alternative specifications. Inter alia, we assume deficit-financing of unemployment benefits or employment-dependent productivity (hysteresis). The extensions generally – but not always – tend to support our finding that countercyclical entitlement duration is not a good idea from the German perspective. In these extensions, we even neglect political incentives to shorten entitlement duration in good times or problems identifying the current cyclical situations.

Nicht-technische Zusammenfassung

Im Zusammenhang mit der aktuellen Krise wurde der Vorschlag gemacht, die Bezugsdauer für Lohnersatzleistungen von der jeweiligen konjunkturellen Situation abhängig zu machen, und sie in der Rezession zu verlängern. In diesem Papier untersuchen wir, wie sich ein solcher Vorschlag auf die Beschäftigung und die Wohlfahrt auswirkt. Dazu verwenden wir ein Real Business Cycle Modell, wobei der Arbeitsmarkt durch Suchfriktionen gekennzeichnet ist.

Im theoretischen Teil wird zwischen zwei verschiedenen Arten von Lohnersatzleistungen unterschieden: Zunächst erhält ein arbeitsloser Haushalt einen bevorzugten Satz an Arbeitslosengeld, der im weiteren Verlauf der Arbeitslosigkeit aber gesenkt wird. Wir untersuchen nun, wie es sich auswirkt, wenn bei einem negativen Schock auf die Volkswirtschaft die Bezugsdauer für das privilegierte Arbeitslosengeld verlängert wird. Dabei betrachten wir die Wirkungen auf die Beschäftigung und auf die Wohlfahrt. Die Verlängerung der Bezugsdauer führt zu einem höheren Reservationslohn, einem höheren tatsächlichen Lohn und zu einem Rückgang von Beschäftigung, Produktion und Konsum. Andererseits kann eine solche Politik zu einer Kosumglättung führen, da die Haushalte in der Rezession mehr konsumieren können. Dies für sich genommen erhöht die Wohlfahrt. Welcher der beiden Effekte überwiegt, kann nicht ohne weiteres gesagt werden.

In einem zweiten Schritt wird das Modell kalibriert und zwar einmal so, dass es möglichst mit EU-Daten übereinstimmt und einmal so, dass es besser zu US-Daten passt. In diesem Zusammenhang ist vor allem wichtig, dass die amerikanischen Arbeitsmärkte vergleichsweise flexibel sind, und die Verhandlungsmacht der Gewerkschaften gering ist. Es zeigt sich, dass für die USA die negativen Beschäftigungseffekte relativ gering ausfallen und das vorteilhafte Argument der Konsumglättung überwiegt. Dementsprechend erweist sich auch eine antizyklische Politik, wie sie vorgeschlagen wurde, als optimal. Umgekehrt ist für Europa – und vermutlich auch für Deutschland – eine solche Politik nachteilig. Stattdessen wäre nach unserem Modell sogar eine prozyklische Politik optimal, weil sie den Inflexibilitäten am Arbeitsmarkt entgegenwirkt.

Schließlich werden eine Reihe von Erweiterungen untersucht, um die Robustheit unserer Schlussfolgerungen zu überprüfen. Unter anderem wird angenommen, dass das Budget der Arbeitslosenversicherung nicht immer ausgeglichen sein muss, sondern dass eine vorübergehende Defizitfinanzierung möglich ist. Zum anderen wird untersucht, wie es sich in diesem Zusammenhang auswirkt, wenn die Produktivität von Arbeitnehmern dadurch leidet, dass sie nicht beschäftigt sind (Hysterese). Diese Erweiterungen tendieren generell – aber nicht immer – dazu, unser Argument, dass eine zyklische Anpassung der Bezugsdauer von Lohnersatzleistungen für Deutschland keine gute Idee ist, zu verstärken. Dabei bleiben politökonomische Gründe, wie die Schwierigkeit, eine verlängerte Bezugsdauer wieder umzukehren, sogar unberücksichtigt.

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Unemployment Insurance and the Business Cycle: Prolong Benefit Entitlements in Bad Times?[1]

1. Introduction

The current economic downturn and the fact that unemployment is expected to rise significantly has again triggered a political debate on the optimal duration for entitlements to unemployment pay. Calls for countercyclical unemployment benefits or for an extension of current benefit duration have been made by the IMF, the OECD and the German Council of Economic Experts (see Blanchard et al., 2008; OECD, 2009; and SZ, 2009), while rules linking the generosity of the unemployment insurance system to the state of the economy can, for example, already be found in Canada, in some US states (see Committee on Ways and Means, 2004) or, in a more semi-automatic way, in Sweden. Not surprisingly, these calls are rejected by business representatives, however. The present paper contributes to the question of business cycle contingency in unemployment insurance from a real business cycle perspective.

The analysis in the present paper is probably most closely related to the work of Costain and Reiter (2005) in terms of the model setup. We present a real business cycle model in which the economy is populated by a continuum of representative households which is normalized to one. Households obtain utility from consumption, while providing labor causes disutility. Consumption is financed by taxed labor income when employed, unemployment benefits when unemployed and savings. For analytical simplicity, we assume lump sum taxation but it can be shown that our results are also valid with tax distortions. The labor market is characterized by search frictions as described by Mortensen and Pissarides (1994) with an exogenous job destruction rate. This implies that firms and workers have to invest time and effort to find each other before production can take place. The finding process is described by a matching function. Wages are determined by Nash bargaining between firms and workers. The government maintains a mandatory unemployment insurance scheme under which each worker, after being dismissed, first receives premium benefits for a predetermined period of time. When this period is over, these premium benefits are cut to a lower level (potentially to zero). The government may decide to make the entitlement duration to premium benefits state contingent. All benefits per unemployed worker have to be financed by contributions made by the working population.

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From a purely theoretical perspective, we obtain the following results. In a recession, represented by a temporary but persistent negative productivity shock, job creation falls, which implies an increase in premium benefit recipients. Indeed, prolonging entitlement duration reduces the inflow of unemployed workers into the "second pillar" of the insurance system which implies that the fraction of premium benefits recipients to total unemployment increases relatively (or even absolutely provided the duration of entitlement is lengthened sufficiently). We identify a relative increase in average unemployment benefits per unemployed worker yielding, in relative terms, higher fall-back utility, higher tax rates, higher wages and, hence, relatively less employment. Nevertheless, this need not necessarily imply a higher decrease in the level of consumption. Due to the higher average unemployment benefit per unemployed worker and the higher wage per employed worker, it is theoretically possible for consumption to stay constant or even increase if employment does not fall too much. Given that providing labor causes disutility, the only slightly lower (or even higher) level of aggregate consumption and the prolonged unemployment spell may increase the welfare of the representative agent, measured as the discounted sum of utility consisting of consumption and the disutility of providing labor. Hence, we may conclude that countercyclical benefit policies can strengthen automatic stabilizers.[2]

As this ambiguous result is somewhat unsatisfactory to answer the question raised in this paper, we calibrate the model to European and US data along the lines of Shimer (2005) for the US and Christoffel et al. (2009) for Europe. In principle, the calibration tells us that the US labor market is quite flexible in terms of forming new matches on the labor market and employer-friendly (in terms of bargaining power and benefit policies), while the European labor market seems more inflexible and fairly employee-friendly. Looking for the optimal adaption rule of entitlement duration to business cycle fluctuations, we find that it should indeed react countercyclically for the US but even procyclically for Europe – the latter implying a decrease in entitlement duration in the current downturn. We conclude that countercyclical entitlement duration is only advisable if the negative effects this has on the labor market are not strong enough to outweigh the positive effects resulting from consumption smoothing. Putting this result into the perspective of economic literature, we note that, in the US, the bargaining power of workers is smaller than the matching elasticity. Given a search and matching labor market, this implies an inefficient labor market outcome characterized by the creation of too many vacancies and, hence, too little unemployment (see Hosios, 1990) because, from the individual firm's perspective, it is quite attractive to create new jobs as its expected profits are relatively high. However, vacancy creation causes an externality on other firms as it reduces the probability of finding a worker (see Pissarides, 2000). The increased fall-back utility of workers due to longer premium benefit entitlements counteracts this inefficiency and, thus, increases welfare. The opposite holds for

[2]It is well known from the literature on optimal stabilization policy that households prefer a smooth consumption path and may indeed be willing to pay a price to reduce the consumption risk associated with periods of unemployment (based on Lucas, 1987; such analyses may be found inter alia in Obstfeld, 1994; Tallarini, 2000; and Otrok, 2001), which we can interpret as a desire for insurance.

the European case. As inefficiencies emerge more prominently whenever the economy faces cyclical fluctuations, our model predicts that fighting these inefficiencies by prolonging entitlement duration in the US and shortening it in Europe may be the method of choice.

From the literature, we already know that optimal unemployment insurance policy, not only across the business cycle, constitutes a trade-off of insurance and incentive mechanisms. While there is some literature on the design of unemployment insurance schemes regarding the, say, steady-state situation (see Frederiksson and Holmlund, 2006; for an overview), it is somewhat surprising that there is hardly any theoretical or empirical literature exploring the effects of business cycle dependent unemployment insurance. In a search and matching model, Kiley (2003), Sanchez (2008) and Andersen and Svarer (2009) argue that there is indeed room for countercyclical unemployment benefit policy but that the negative correlation should be weaker in a downturn than in an upturn. In these partial equilibrium models, it is however assumed that benefits are more distortionary in a boom than in a recession. Costain and Reiter (2005) show in a business cycle model in which they allow for deficit financing that benefits should basically be invariant, while social security contributions ought to be procyclical. This indicates that, first, unemployment benefits seem more harmful to labor markets than taxation. Second, at least to a certain extent, these findings can be related to the literature on optimal fiscal tax policy which states that, (a) tax smoothing may be optimal, and (b) the distortionary effects of taxes may be less severe in upturns than in downturns (see also Barro, 1979; Lucas and Stokey, 1983; and Canzoneri et al., 2008; among others). On the empirical side, Arulampalam and Stewart (1995) and Jurajda and Tannery (2003) find that unemployment benefits affect the incentive mechanism and, hence, the negative labor market consequences more in an upturn than in a downturn, while Røed and Zhang (2005) do not find any difference across the business cycle.

In our analysis, there are some possible extensions worth mentioning which are discussed in more detail in the last section of the paper to test the robustness of our results. For example, we have assumed constant search effort. Assuming that prolonging the entitlement period reduces search effort (significantly), this may weaken the desired consumption smoothing effect and strengthen the negative labor market effect. Or, assuming that productivity itself is dependent on the labor market situation due to some hysteresis or “learning-by-doing” mechanism (as in Ball, 2009; or Aghion and Saint-Paul, 1998; for example), this may have the same effect depending on how influential these mechanisms are. On the other hand, whenever a more generous unemployment insurance system is able to increase match quality sufficiently (as, for example, pointed out by Acemoglu and Shimer, 2000), we may identify countercyclical entitlement duration to be optimal also for the European calibration. There are also general issues, such as the fact that identifying the actual current economic situation – which is assumed to be known immediately by the agents in the present model – is certainly very difficult or impossible in praxis. Furthermore, the model is calibrated to the data following recent – but past – economic literature. As the parametric choice, including the desire for smoothing (i.e. risk aversion), may have changed in the current downturn, this may strengthen the argument for countercyclical policy. Last, but not least, we neglect any political incentives in the current model. While it is certainly always easy to prolong entitlement duration in bad times, cutting it back is unlikely to happen. We leave a more sophisticated analysis of all these issues for further research. However, given our model and the extensions, it does not seem bad to conclude that keeping entitlement duration constant across the cycle and letting "the automatic stabilizer unemployment insurance" take effect may be the most implementable and reasonable way to go, at least from the European perspective.

The rest of the paper is organized as follows. Section 2 describes the model and how it is calibrated. In section 3, we derive the optimal rule determining the entitlement length from a welfare perspective and show the dynamic properties of the model under different rules, especially including the optimal and current rule. Section 4 concludes.

2. The model

There is a continuum of agents whose total measure is normalized to one. Households consume different varieties of goods, save and work. As in Andolfatto (1996) and Merz (1995), representative households pool their income and, thus, insure themselves against unemployment risk to a certain degree. Each agent can be employed or unemployed. In the first case, he receives a wage Nash bargained with his employer, while in the second case, he receives unemployment benefits. The labor market is characterized by matching frictions and exogenous job destruction as, for example, described in Pissarides (2000). While unemployed, the worker may be in one of two pillars of the unemployment insurance system. In the first pillar, he is entitled to receive premium unemployment benefits amounting to a certain percentage of his previous net wage. After a politically determined period of time, the worker moves to the second pillar of the insurance system in which the benefits he is entitled to are cut.[3] In the production sector, goods are produced with labor and capital. The inclusion of capital allows us to generate more pronounced cycles but has no qualitative implications (see, for example, also Burda and Weder, 2002).

[3] As we are not able to track each individual in the representative agent model presented below, this is captured by a given probability of moving from the first to the second pillar of the insurance system. However, this way of modelling is able to capture the average duration workers stay in each stage. As we are focussing on averages, this inaccuracy does not harm our analysis, which is, furthermore, a common procedure in matching labor markets; see also Cahuc and Le Barbanchon (2008) or Andersen and Svarer (2009), among others.

2.1. Households

There is a continuum of representative agents who maximize their expected lifetime utility[4]

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t u_t \left(c_t, N_t \right) \right\}, \tag{1}$$

where E_t is the expectations indicator at $t = 0$, c_t denotes the agent's consumption of final goods and $u_t(.)$ is the instantaneous utility function given by

$$u\left(c_t\right) = \begin{cases} \frac{c_t^{1-\sigma_c}-1}{1-\sigma_c} - \kappa^N \frac{N_t^{(1+\sigma_N)}}{(1+\sigma_N)}, & \sigma_c > 0, \sigma_c \neq 1, \sigma_N > 0 \\ log\left[c_t\right] - \kappa^N \frac{N_t^{(1+\sigma_N)}}{(1+\sigma_N)}, & \sigma_c = 1, \sigma_N > 0 \end{cases}. \tag{2}$$

The elasticity of consumption σ_c can be interpreted as a risk-aversion parameter. When employed, households suffer disutility and receive a real wage w_t. The employment rate per representative household and, thus, the economy is given by N_t. σ_N is the inverse of the Frisch elasticity of labor supply and κ^N a level parameter relating the disutility of labor to the utility of consumption. Wages, employment and unemployment are determined on the labor market. When unemployed, household members are entitled to the premium benefit κ^B. Their number is given by U_t^s which we will term short-term unemployment in the following. Those only entitled to normal benefits receive an income b per period, while their number is denoted by $U_t^l = (1 - U_t^s - N_t)$, which we term long-term unemployment in the following. Hence, total employment is given by N_t, while we can denote total unemployment as $U_t = U_t^s + U_t^l = (1 - N_t)$. Both types of unemployment benefits have to be financed by taxes levied lump-sum at rate τ_t.[5] Households can also invest in capital k_t which pays interest r_t and depreciates at rate δ. Firms' profits Π_t, which result from an imperfect labor market, are redistributed to the households. Hence, the sequence of real budget constraints reads as follows:

$$c_t + I_t = (w_t - \tau_t)N_t + U_t^s \cdot \kappa^B + U_t^l \cdot b + r_t k_t + \Pi_t, \tag{3}$$

[4]Note that, as we focus on representative households, which implies that, in equilibrium, they will all consume symmetrically and work the same amount, we abandon the bothersome individual indices right from the beginning. Furthermore, including liquidity-constrained households (along the lines of Gali et al., 2007), who can neither save nor borrow and, thus, consume all their period income, which generates a true consumption risk from unemployment, does not alter our results qualitatively. Hence, to simplify the model, we stick to the representative household assumption.

[5]Lump-sum taxation is assumed for mathematical simplicity. Including tax distortions, which may contribute to a worsening of the labor market situation when augmenting entitlement duration as expenditures, tax rates and, thus, distortions will rise, does not alter our results qualitatively.

where I_t denotes investment, while capital evolves according to

$$k_{t+1} = (1-\delta)k_t + I_t. \tag{4}$$

Households choose the set of processes $\{c_t, k_t\}_{t=0}^{\infty}$ taking as given the set of processes $\{w_t, r_t, N_t, U_t^s, U_t^l\}_{t=0}^{\infty}$ and the initial wealth b_0 and k_0, so as to maximize (1), given (2), subject to (3) and (4). Defining the Lagrangian multiplier on constraint (3) as λ_t and substituting (4) into (3), the following optimality conditions must hold

$$\text{for } c_t\text{:} \quad \lambda_t = c_t^{-\sigma_c}, \tag{5}$$

$$\text{for } k_t\text{:} \quad \lambda_t = \beta E_t \left\{\lambda_{t+1}\left[(1-\delta) + r_{t+1}\right]\right\}. \tag{6}$$

Equation (5) is the marginal utility of consumption, equation (6) is the Euler condition and determines the optimal capital investment. Optimality additionally requires that the No-Ponzi condition on wealth is satisfied, which we assume to hold henceforth.

2.2. The production sector

Firms in the production sector sell their output in a competitive market and meet workers on a matching market. Labor relations are determined according to a standard and often cited Mortensen and Pissarides (1999) framework (whereas the model with exogenous job destruction can more easily be traced in Pissarides, 2000). Workers must be hired from the unemployment pool and searching for a worker involves a fixed cost. Wages are determined through decentralized Nash bargaining. In what follows, we will describe the matching process, firms' behavior and the wage setting process in more detail.

2.2.1. Search and matching in the labor market

In order to find a worker, firms have to start searching which is costly due to frictions on the labor market and involves time. The probability of finding a worker depends on a constant return to scale matching technology which converts unemployed workers U_t and vacancies V_t into matches. The number of employer contracts per unit of time is given by

$$M_t(U_t, V_t) = \kappa^e U_t^{\eta} V_t^{1-\eta}, \tag{7}$$

where κ^e is a matching efficiency parameter. Defining labor market tightness $\theta_t = V_t/U_t$ as usual, firms meet with an unemployed worker at rate $q_t = M_t(U_t, V_t)/V_t = \kappa^e \theta_t^{-\eta}$. Unemployed workers find a vacant job at rate $p_t = \theta_t q_t = M_t(U_t, V_t)/U_t = \kappa^e \theta_t^{1-\eta}$. If the process is successful, the representative firm in the goods sector starts production, which is explained in the next subsection. Matches are destroyed at an exogenous rate

s. When a job is destroyed, workers become unemployed and are entitled to premium unemployment benefits κ^B. With probability ϑ_t, they will move to the stage in which they are only entitled to normal benefits b. ϑ_t is determined by the government depending on the generosity of the unemployment insurance system. With these features at hand, we are now in a position to determine the law of motion for employed workers and those seeking a job, i.e. the unemployed workers in the different insurance stages. The number of employed people at time t is given by the number of employed people at time $t-1$ who did not discontinue the match plus the number of short-term unemployed people U_t^s and the number of long-term unemployed U_t^l who found a job at time $t-1$,

$$N_t = (1-s)N_{t-1} + p_{t-1}\left[\overbrace{U_{t-1}^s + U_{t-1}^l}^{=U_t}\right]. \tag{8}$$

The stock of short-term unemployed workers at time t consists of those workers in this stage who did not find a job or were moved to the long-term unemployment stock at time $t-1$ and those who were dismissed in period $t-1$,

$$U_t^s = (1-\vartheta_{t-1} - p_{t-1})U_{t-1}^s + sN_{t-1}. \tag{9}$$

The stock of long-term unemployed people at time t can also be calculated as those who did not find a job at time $t-1$ plus those who moved from short to long-term unemployment at time $t-1$, i.e.

$$U_t^l = (1-p_{t-1})U_{t-1}^l + \vartheta_{t-1}U_{t-1}^s. \tag{10}$$

2.2.2. The firm

The representative firm operates the following production technology

$$y_t = h_t^{skill} \cdot z_t \cdot k_t^{\alpha} \cdot N_t^{(1-\alpha)}, \text{ with } \alpha \in (0,1), \tag{11}$$

where z_t is an aggregated technology (or productivity) shock which follows an AR(1) process with persistence ρ_z and ϵ_z is an i.i.d. random shock. N_t is the number of workers employed in the representative firm, while k_t is the amount of capital used in the production process. We assume $h_t = 1, \forall t$ for now as we will only need it when discussing possible extensions in section 3.4. It will then measure possible productivity effects resulting from a hysteresis argument. The firm will choose to maximize the following dynamic optimization problem

$$\max \Pi_t = E_0 \sum_{t=0}^{\infty} \beta^t \frac{\lambda_{t+1}}{\lambda_t} \{y_t - w_t N_t - r_t k_t - \kappa^v V_t\} \tag{12}$$

by choosing employment N_t, the amount of capital k_t and the number of vacancies V_t to post in order to generate future employment subject to

$$N_t = (1-s)N_{t-1} + q_{t-1}V_{t-1},$$

which is the employment law of motion from the firm's perspective, as well as taking into account (11). Wages are derived in the next subsection. Defining μ_t as the Lagrangian multiplier on the employment law of motion, first-order conditions are

$$\text{for } N_t\text{:} \quad \mu_t = (1-\alpha)\frac{y_t}{N_t} - w_t + \beta E_t\left\{\frac{\lambda_{t+1}}{\lambda_t}(1-s)\mu_{t+1}\right\}, \tag{13}$$

$$\text{for } k_t\text{:} \quad r_t = \alpha\frac{y_t}{k_t}, \tag{14}$$

$$\text{for } V_t\text{:} \quad \frac{\kappa^v}{q_t} = \beta E_t\left\{\frac{\lambda_{t+1}}{\lambda_t}\mu_{t+1}\right\}. \tag{15}$$

Merging equations (13) and equations (15) and with some rearranging, we get $(1-\alpha)\frac{y_t}{N_t} = \frac{w_t}{z_t} + \frac{\mu_t-(1-s)\kappa^v/q(\theta_t)}{z_t}$, which states that the firm's marginal costs for labor are given by the effective (i.e. adjusted by average productivity z_t) wage costs of each single employee plus an extra component for future employees. Since vacancy posting is costly, a successful match is valuable for the firm as it reduces future search costs (see also Krause and Lubik, 2007; for more details).[6]

2.2.3. Wage setting and Bellman equations

The wage schedule is obtained through a Nash bargaining game between the firm and a union that maximizes the gain of its members from employment over unemployment as formulated by Oswald (1993).[7] Because representative households are able to smooth income fluctuations associated with periods of unemployment as in Andolfatto (1996) and Merz (1995), i.e. households pool their income, the union wage bargaining structure and bargaining at the household level are basically the same in result. If we assumed

[6] Note for now, however, that the future value of a current employee also depends on the evolution of employment. If the number of unemployed workers decreases, the probability of filling a vacancies falls, which implies that search duration and, hence, the value of a future worker increases.

[7] 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 Booth, 1995; Garibaldi and Violante, 2005; Goerke et al., 2007; Oswald, 1982, 1993; and Pencavel, 1991; among others). The representation here follows Stähler (2008) and assumes that the union maximizes the gain from employment over unemployment, which allows us to use the bargaining structure applied in Sinko (2004).

wage bargaining between firms and each individual worker, we would have to apply a two-tier wage structure because the fall-back utility of those workers employed or in the first pillar of the unemployment insurance system differs from those in the second pillar. However, the qualitative results obtained in our analysis do not differ (because average wages are affected in the same way), which is why we stick to the union interpretation.

In order to be able to calculate the wage bargaining, we need to derive the marginal value of a match for both the firm and the union (see Pissarides, 2000). As μ_t is this marginal value for the firm, it is already given by equation (13). Hence, it depends on marginal production minus wage payments plus the discounted continuation value. Further, we note that equation (15) is an arbitrage condition stating that the expected value of a newly created job, the rhs of equation (15), has to equal expected search costs, the lhs of the same equation. It is, thus, the job creation condition implying that the value of posting a vacancy must be zero in equilibrium due to the zero-profit condition and free market entry (for more details, see Pissarides, 2000).

By using equations (1), (2) and (3), the marginal value to the union of a match is given by (see Appendix A for the derivation)

$$\begin{aligned} W_t &= w_t - \tau_t - \gamma_t \kappa^B - (1-\gamma_t)b - \frac{\kappa^N}{\lambda_t} N_t^{\sigma_N} \\ &+ \beta E_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \left[(1-s-p_t) W_{t+1} + (\vartheta_t \gamma_t + s(1-\gamma_t)) \left(V_{t+1}^{U^s} - V_{t+1}^{U^l} \right) \right] \right\}, \quad (16) \end{aligned}$$

where $\gamma_t = U_t^s / U_t$ is the share of unemployed workers receiving premium benefits, $(1-\gamma_t) = U_t^l / U_t$ the share of those receiving normal benefits and

$$\left(V_t^{U^s} - V_t^{U^l} \right) = \kappa^B - b + \beta E_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} (1 - p_t - \vartheta_t) \left(V_{t+1}^{U^s} - V_{t+1}^{U^l} \right) \right\}$$

is workers' marginal utility difference from staying in the premium benefit pillar of the unemployment insurance and finding a job or moving to the second pillar which occurs with probabilities p_t and ϑ_t, respectively. This plus the average unemployment benefit per unemployed worker resulting from the first and the second pillar of the insurance system, i.e. $\left(\gamma_t \kappa^B + (1-\gamma_t) b\right)$, can be seen as the fall-back utility or reservation wage, respectively.

Given the bargaining power of worker $\xi \in (0,1)$, we find that wages are determined by

$$\max_{w_t} \; S(w_t) = [W_t]^{\xi} \, [\mu_t]^{1-\xi}. \quad (17)$$

The resulting sharing rule is given by

$$W_t = \frac{\xi}{1-\xi} \cdot \mu_t, \quad (18)$$

which states that the share of the matching surplus the worker receives depends on his bargaining power. Solving equation (18) for w_t by using equations (13) and (16) yields the basically standard wage equation

$$w_t = \xi \left[(1-\alpha)\frac{y_t}{N_t} + \kappa^v \theta_t \right] \quad + \quad (1-\xi) \left[\tau_t + \gamma_t \kappa^B + (1-\gamma_t) b \right.$$
$$\left. + \quad \beta E_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \left(\vartheta_t \gamma_t + s(1-\gamma_t) \right) \left(V_{t+1}^{U^s} - V_{t+1}^{U^l} \right) \right\} \right]. \quad (19)$$

2.3. The government

The government is represented by the unemployment insurance system's budget constraint. Unemployment benefits under the first and the second pillar of the insurance system have to be financed by labor tax revenues. Hence, the constraint reads

$$\tau_t \cdot N_t = U_t^s \cdot \kappa^B + U_t^l \cdot b. \quad (20)$$

As the government sets ϑ_t according to the generosity of the unemployment insurance system, it may also adapt this across the cycle. Note that the higher ϑ_t is, the shorter is the period for which unemployed workers stay in the first pillar of the insurance system, i.e. the less generous it is. We assume that, if the government adapts the entitlement period to receive premium benefits κ^B, it will adapt it according to the following rule

$$\hat{\vartheta}_t = \rho^\vartheta \hat{\vartheta}_{t-1} + (1-\rho^\vartheta) \left[\phi_y \hat{y}_{t-1} + \phi_u \hat{U}_{t-1} \right], \quad (21)$$

where the hat indicates deviations from the steady-state value of the corresponding variable. Hence, ϑ_t can be modified when unemployment fluctuates according to parameter ϕ_u and when output fluctuates according to the parameter ϕ_y, while ρ^ϑ is a smoothing parameter indicating the persistence of these changes. The aim is to find the parameters ρ^ϑ, ϕ_y and ϕ_u that maximize welfare measured as the discounted utility of households across the cycle (i.e. equation (1) given (2)). The argument for including unemployment and output fluctuations into the rule is that these variables are observable in praxis and they are the ones politicians focus their attention on. Integrating smoothing is motivated by the fact that, in general, changing entitlement duration is usually quite persistent in the political process. Once the government follows a policy of constant entitlement duration, $\rho^\vartheta = \phi_y = \phi_u = 0$.

2.4. Equilibrium

In equilibrium, aggregate production has to equal demand. Furthermore, resources wasted in search activity and investment also have to be financed, i.e.

$$y_t = c_t + I_t + \kappa^v V_t, \tag{22}$$

which implies that markets clear.

2.5. Some theoretical predictions of the model

We are now in a position to analyze the cyclical implications of our theoretical model. To do this, we assume that productivity z_t falls to generate a recession.

In this case, we see from equation (11) that firms' ability to produce decreases and production falls. It becomes less attractive to create new jobs as the expected marginal profit of an additional worker decreases, as described in equation equations (13) and (15). Because of lower current productivity and re-employment chances, this implies a decrease in wages, equation (19). The demand for capital also falls, lowering the capital interest rate, equation (14).

Lower labor demand / job creation implies fewer vacancies, which reduces the number of newly created matches, equation (7), and naturally decreases unemployed workers' chances of finding a new job, p_t. This implies a decrease in employment, (8), while unemployment rises. We further see that both short and long-term unemployment increase, equations (9) and (10), while the growth in long-term unemployment will become relatively stronger as productivity stays low as long as $\vartheta_t > s$, which implies a decrease in the fraction of unemployed people receiving premium benefits, γ_t.[8] The logic behind this is as follows. Lower job creation implies less outflow from U_t^s and U_t^l, while inflows into U_t^s remain constant due to the exogenously given dismissal probability s. As the stock U_t^s now increases, this implies that more people move from U_t^s to U_t^l than from N_t to U_t^s for ϑ_t constant and $\vartheta_t > s$, which seems a reasonable assumption (see also the following section detailing this assumption). The decrease in the fraction γ_t further lowers wages because average expected unemployment benefits per worker fall; see also equation (19). Taxes have to be increased, however, as more unemployed workers have to be financed; see equation (20).

Lower wage income and average unemployment benefits as well as higher taxes and less capital revenues (see equation (6)) decrease the household's disposable income, its capital investment and, more importantly, its consumption level, as is obvious from equation (3). A lower level of consumption decreases utility, equations (1) and (2). This may partly be compensated for by less disutility of providing labor, however, full compensation is unlikely. Given a decreasing returns to scale utility function in consumption, this loss in utility is higher than the utility gain of an equivalent increase in produc-

[8]Formally, this can easily be seen by solving equation (8) to (10) for N_t, U_t^s and U_t^l.

tivity z_t would be. Hence, households have a preference for consumption smoothing. As z_t eventually moves back to its steady state, so do all the other variables.

Assume now that the government decides to counteract the utility loss by prolonging entitlement duration for premium benefits κ^B, which represents a decrease in ϑ_t, the probability of moving from U_t^s to U_t^l. Then, the fraction of people entitled to premium benefits γ_t decreases relatively less (or even increases if the fall in ϑ_t is strong enough), which implies a relative increase in average unemployment benefits per unemployed worker, even higher taxes and, thus, a wage increase; see equation (19). Higher wages make it even less attractive for firms to create new jobs, equations (13) and (15), which implies that, on the labor market, the situation deteriorates. Employment and production fall relatively more and it takes longer to move the variables back to steady state. Hence, on the labor market, it is indeed true that such a policy contributes to an increase in unemployment.

But does this also hold for welfare? Prolonging entitlement duration implies higher average unemployment benefits per unemployed worker and, thus, higher wages per employed worker, while employment is relatively lower than before. Given fewer employed people with a relatively higher income and more unemployed people, also with a relatively higher income (of course, their income is still lower than that of employed people when ϑ_t is constant), it is not clear what happens to aggregate disposable income used for consumption. If the negative labor market effects are not too strong, consumption may, theoretically, increase, which is welfare-enhancing. In this case, the consumption smoothing effect dominates, and such a policy can be considered advisable from the view-point of our model. If the labor market effect dominates, however, it not only worsens the labor market situation but also welfare.

Because these results derived purely theoretically are quite unsatisfactory in answering the question raised in this paper, we will calibrate the model in the following subsection to gain some further insights and to be able to give more adequate policy advice.

3. Optimal entitlement duration and dynamic properties of the model under different policy rules

In this section, we will first calibrate the model to US and European data as the labor market flexibility of these countries differs and, therefore, policy advice may differ as well. Second, we will determine the optimal reaction of entitlement duration to cyclical fluctuations by assuming that the policy maker maximizes households' welfare subject to the competitive equilibrium conditions. Third, we will describe the dynamic properties of these economies under the optimal rule, constant entitlement duration and a false rule as well as compare the economies once they both follow their optimal rule. Last, we will discuss the findings in more detail and point out possible extensions to check the robustness of our analysis.

3.1. Calibration

The benchmark is calibrated according to quarterly frequencies. We distinguish between two scenarios reflecting a fairly flexible and a somewhat inflexible labor market terming them US and European, respectively. We follow Shimer (2005) in setting the US labor market parameters and Christoffel et al. (2009) for the European ones. The baseline calibration is summarized in Table 1. For households' preferences, the time-discount factor β is chosen to match an average annual interest rate of 4%, which implies $\beta = 0.99$. The value of the risk-aversion parameter is set to 1.5 as reported in Smets and Wouters (2003). The value of the curvature of disutility of work, $\sigma_N = 2$, follows the estimates of Smets and Wouters (2003) and Demeij and Flodén (2006), which makes the Frisch elasticity of labor supply equal to 0.5.[9]

Turning to the labor market, we set the matching elasticity η to 0.6 for Europe according to the estimates of Burda and Wyplosz (1994). Following Shimer's (2005) estimations, this value is 0.72 for the US. The bargaining power of workers ξ is set to the conventional value of 0.5 for the US, which lies towards the lower end of the range reported by Petrolongo and Pissarides (2001), while Flinn (2006) reports even lower values. The value is set a bit higher, to 0.6, in Europe as we can presume that unions are stronger there. Note that the condition of Hosios (1990) is not fulfilled in either case. We discuss this issue in more detail in section 3.3 (including the discussion of what happens once the Hosios condition is fulfilled). Following Hobijn and Sahin (2007), we set the quarterly separation rate $s = 0.03$ for Europe and the US. The equilibrium unemployment rates for the US and Europe are calibrated to 5.5% and 9%, respectively. In the steady state, the number of matches must be equal to the number of separations, $\bar{M} = \kappa^e \bar{U}^{\xi} \bar{V}^{1-\xi} = \bar{q} \cdot \bar{V} = s \cdot \bar{N}$, where the bar indicates steady-state values and $\bar{U} = \bar{U}^s + \bar{U}^l$. Following Andolfatto (1996), we target $\bar{q} = 0.9$ for the US and $\bar{q} = 0.7$ for Europe (see Christoffel et al., 2009). This implies that we have to set $\kappa^e = 0.593$ for the US and $\kappa^e = 0.461$ for Europe. Further, we know that $\bar{p} \cdot \bar{U} = s \cdot \bar{N}$, which allows us to solve for $\bar{p}$. In line with current legislature, we assume that average premium benefit entitlement is for one year after dismissal in both the US and Europe. This implies that, in the steady state, we set $\bar{\vartheta} = 0.25$, which yields $\bar{U}^s = \left(\bar{\vartheta}/(\bar{\vartheta} + \bar{p})\right) \bar{U}$ from which we are able to calculate $\bar{\gamma}$ and $\bar{U}^l$. We choose a capital depreciation rate $\delta = 0.025$ and the capital exponent in the production function $\alpha = 0.7$, which are standard parameters in real business cycle models (see Cooley and Prescott, 1995; or Burda and Weder, 2002; for example). Choosing $\bar{z} = 1$ allows us to calculate the steady-state capital stock, capital interest, investment and output. Vacancy costs are a proportion of steady-state production fixed at 20%.

We assume, referring to current legislation, that the replacement rate ($rrs1$) in the first pillar of the unemployment insurance system is equal to 40% in the US and 65% in Europe, while the replacement rate in the second pillar ($rrs2$) of the unemployment

[9]Note that our analysis is not sensitive to this parameter and assuming $\sigma_N = 0$, which may be more in line with the indivisible labor assumption along the lines of Hansen (1985) or Rogerson (1988), does not alter our results qualitatively.

insurance scheme falls to zero in the US and to 20% in Europe. Hence, $\kappa^B = rrs1 \cdot \bar{w}$ and $b = rrs2 \cdot \bar{w}$. We are then able to calculate the steady-state tax rate $\bar{\tau}$, wages $\bar{w}$ as well as the parameter κ^N such that the wage sharing rule is satisfied for the targeted values. Hence, we have solved for the steady state of the economy. For the productivity shock, we assume high autocorrelation, $\rho_z = 0.95$ (see Burda and Weder, 2002; for a discussion) and a standard deviation of 0.39 (see Christoffel et al., 2009) for both the US and Europe.

Parameter	Symbol	USA	Europe
Preferences			
Discount factor	β	0.990	0.990
Risk aversion	σ_c	1.500	1.500
Labor disutility	σ_N	2.000	2.000
Bargaining and production			
Matching elasticity	η	0.720	0.500
Bargaining power	ξ	0.500	0.600
Separation rate	s	0.030	0.030
Matching scaling	κ^e	0.593	0.461
Steady-state productivity	$\bar{z}$	1.000	1.000
Vacancy costs	κ^v	0.200	0.200
Capital depreciation	δ	0.025	0.025
Capital productivity	α	0.700	0.700
Policy			
Entitlement value	$\bar{\vartheta}$	0.250	0.250
Replacement rate (first)	$rrs1$	0.400	0.650
Replacement rate (second)	$rrs2$	0.000	0.200
Shock			
Autocorrelation	ρ_z	0.950	0.950
Standard deviation	ϵ_z	0.390	0.390

Table 1: Baseline calibration

3.2. The optimal rules

In this section, the optimal policy problem is solved by assuming that the political authority maximizes households' welfare subject to the competitive equilibrium conditions and the entitlement rule represented by equation (21). Specifically, we search for parametrization of the entitlement duration rule that satisfies the following three conditions: (a) it is simple since it involves only observable variables, (b) it guarantees uniqueness of the rational expectation equilibrium, (c) it maximizes the expected lifetime utility of the representative agent. Expected lifetime utility of the representative agent is given by the lifetime utility, see equations (1) and (2). In order to calculate welfare under different rules, we have to bear in mind that one cannot rely on first-order approximation methods to compare the relative welfare associated with each policy regime. The reason is that within a distorted steady state, which we have here, stochastic volatility affects first and second-order approximation of the moments of the steady-state variables in the economy which is critical for welfare. Hence, in order to rank policy rules correctly, we focus on a second-order approximation (see Kim and Kim, 2003; for more details on the issue of inaccuracy of welfare calculations based on first-order approximations).

Bearing this in mind, we search in the grid for parameters $\{\rho^v, \phi_y, \phi_u\}$ which deliver the highest level of welfare.[10] This is then defined as the optimal entitlement duration rule. Results are as follows. The optimal rule for the US contains smoothing and countercyclically reacts to output and unemployment fluctuations with parameters $\rho^v = 0.9$, $\phi_y = 1.78$ and $\phi_u = -2.5$. This implies that entitlement duration should be prolonged in bad times. For Europe, the rule does not contain smoothing and reacts procyclically to output and unemployment fluctuations with parameters $\rho^v = 0.06$, $\phi_y = -2.5$ and $\phi_u = 0.36$, implying a shortening of the entitlement duration in bad times, while more attention should be devoted to output than to unemployment. The main reason for the different rules can be found in the varying strength of the labor market effect of a productivity shock as hinted at in the theoretical section of this paper. The detailed discussion is relegated to the following section, in which we first turn to the cyclical behavior of the two economies and compare the results.

3.3. Impulse response analysis

In this section, we will analyze the impulse responses of the two economies to a negative productivity shock under different rules regarding the entitlement duration for selected variables and then compare the two economies following the optimal rule just derived. All variables are pictured in log terms and, thus, roughly show percentage deviations from their steady state, i.e. any variable x_t is plotted as $\hat{x}_t = 100 \cdot log\,(x_t/\bar{x})$, which is important to know for the interpretation of large negative deviations.

Figure 1 shows the impulse responses for the US economy. The solid blue lines picture optimal policy (i.e. a countercyclical reaction of the entitlement length), the dotted red lines show what happens under constant entitlement duration and the dashed green lines describe adaptions under a false (i.e. procyclical) rule. It does not come as a surprise that the impulse responses reconcile the effects described in section 2.5, i.e. a fall in output, consumption, wages, capital and interest rates (the three latter not pictured here), while unemployment rises. However, it seems interesting to have a closer look at the magnitude of the effects. Because of the productivity shock, the level of employment only falls by about 1.5% when entitlement duration is left constant and, thus, does not contribute to the decline in output too much. The counterpart can be found in a rise in unemployment by about 20%.[11] Both, short and long-term unemployment

[10]The search is made for the following ranges: $\rho^v \in [0;1]$, $\phi_y \in [-2.5;2.5]$, $\phi_u \in [-2.5;2.5]$.

[11]Note that the difference in the percentage deviation from the steady-state value is due to the log-representation. While the flow in absolute numbers is equal, a worker becoming unemployed generates a much higher deviation from unemployment to its steady-state value than the corresponding loss in employment.

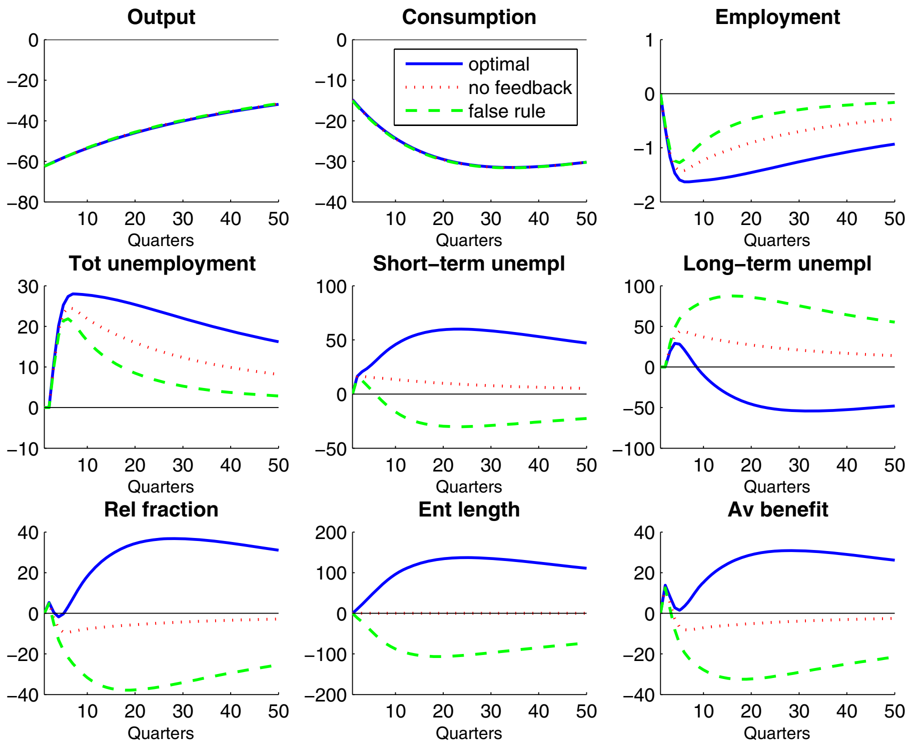

Figure 1: Impulse responses of selected variables to a productivity shock in the US

increases, but the latter to a greater extent, which decreases the relative fraction of those entitled to premium benefits and, thus, reduces average unemployment benefits per unemployed worker as long as entitlement duration is kept constant. Indeed, countercyclically adapting entitlement duration increases unemployment by more, augmenting the share of those entitled to premium benefits relative to the fraction of those only entitled to low benefits. This raises average unemployment benefits per worker and, thus, wages, which lowers employment due to the wage effect previously described in section 2.5. However, the fall in employment is quite small. We see that, when increasing entitlement duration, the employment reduction only rises from 1.5% to about 1.8%, which is not too much, while, when decreasing entitlement duration, the gain is only a reduction in employment of 1.2% compared to 1.5% for a constant or 1.8% for a countercyclical adaption of entitlement duration. As can be seen, the differences in consumption are hardly visible, which can be attributed to the fact that households pool income while the labor market effects are not strong enough to generate a (graphically) visible "wealth" effect. Given basically no consumption difference and lower disutility of providing effort, the welfare metric described earlier indicates that countercyclical entitlement duration is optimal for the US economy. We conclude that this is mainly due to the fact that the labor market is flexible enough to easily cope with the situation and that differences in employment levels are small enough not to overcompensate the desire to smooth consumption.

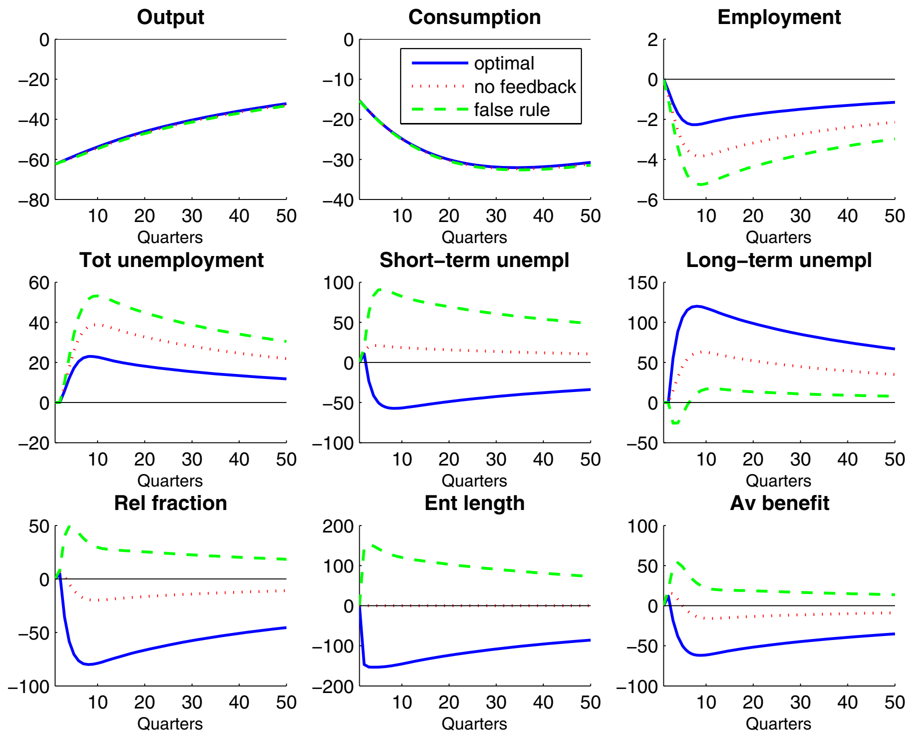

Figure 2: Impulse responses of selected variables to a productivity shock in the EU

The impulse responses for the European economy are shown in Figure 2, where again the solid blue lines depict optimal policy (i.e. now a procyclical(*!*) reaction of the entitlement duration), the dotted red lines show what happens under constant entitlement duration and the dashed green lines describe adaption under a false (i.e. countercyclical(*!*)) rule. The effects are, in qualitative terms, perfectly analogous to those of the US economy. However, we see that the fall in employment is much more pronounced (about 3.5% for a constant, almost 5% for a countercyclical and only 2.2% for a procyclical adaption of the entitlement duration). Inspection of the consumption path shows that there is a (larger) difference and, now, the optimal consumption loss is visibly lower (admittedly, one has to look fairly carefully), while output is a little higher. We conclude that the relatively higher fall in employment and, thus, the relatively stronger negative labor market effect cannot be compensated for by the desire to smooth consumption because aggregate disposable income available for consumption falls (thus, the "wealth" effect is now strong enough). This is because the relatively inflexible labor market is not able to cope with higher average unemployment benefits per worker and, thus, dominates in the welfare metric.

In comparing the two economies under their optimal rule, we find that the countercyclical rule in the US and the procyclical rule in the EU helps to create convergence of the impulse responses of employment. This becomes clear by inspecting Figure 3 in which the solid blue lines picture the European case under the optimal procyclical

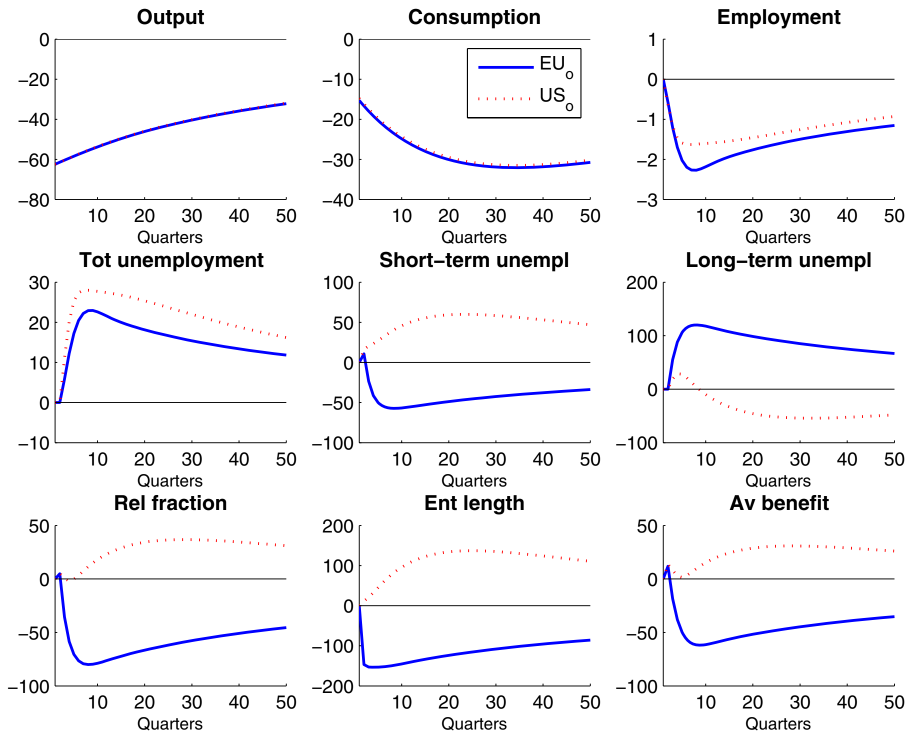

Figure 3: Comparing the impulse responses in the EU and US

rule, while the dotted red lines show the US case for the optimal countercyclical rule. Referring to the Figures 1 and 2 previously described, it is quite clear that, were we to assume a constant entitlement duration, the evolution of employment in the US and Europe would be farther apart (and even farther when choosing the false policy rule in the two countries). Hence, we conclude that adaption of the entitlement duration can serve as a means of balancing the negative labor market effects and the desire to smooth consumption. In the case of relatively flexible labor markets, as is the case in the US, it can be used to strengthen the worker in bad times such that he is able to follow a relatively higher (or at least not lower) consumption path in bad times because the labor market effects are not too strong. The opposite holds for the European case, at least in our baseline calibration, in which the worker's bargaining position should be weakened in order to ease labor market adjustments.

To clarify this point, let us step back one moment and return to our model. At the latest since Hosios (1990), we know that, in frictional labor markets, there is an optimal level of unemployment. In the baseline matching model without policy intervention, this is achieved where the bargaining power of workers equals the matching elasticity, i.e $\xi = \eta$, which is known as the Hosios condition. As there is no reason why it should be fulfilled in praxis, frictional labor markets – which are included in our analysis – yield an inefficient market outcome in general. Whenever the matching efficiency is too high relative to the bargaining power of workers, i.e. $\eta > \beta$, it is quite attractive for firms to create new jobs, but unemployment is too low. The reason is that job creation induces costs because of the search externality. The more vacancies there are, the lower is the probability that the vacancy will be filled and the larger is search duration and, thus, are search costs. Even though a lower level of unemployment does indeed imply a higher level of output, this output has to finance search costs. Once search costs are inefficiently high, the disposable output, i.e. produced output minus search costs, is too low. The opposite holds for $\beta > \eta$ (see also Pissarides, 2000; for quite a detailed discussion of this issue). In the former case (i.e. $\eta > \beta$), an unemployment insurance that strengthens workers' bargaining position, which allows them to demand higher wages, is therefore good from this perspective even though unemployment rises. In the latter case (i.e. $\beta > \eta$), one must find a means of weakening the workers' bargaining position in order to achieve an efficient labor market outcome. Nevertheless, full employment is not optimal in this class of model.

Now, considering the findings of our analysis in this light, we can conclude the following. The US economy seems to be characterized by quite a flexible matching process with a relatively high matching elasticity, while workers' bargaining power is low. This may imply an inefficient labor market outcome with unemployment being too low in the steady state, whereas the inefficiency becomes even more apparent in the presence of cyclical fluctuations. While it is certainly hardly possible to find the "optimal" unemployment insurance to fight these inefficiencies, countercyclically adapting entitlement duration helps to tackle them. This is especially so because the worker is strengthened in bad times when the utility loss is higher. The procyclical stance for Europe can, in this light, be explained by the fact that weakening the worker in bad times helps to improve labor market adjustment, which generates sufficiently more employment (and, thus, wage earners) to tackle the inefficiency here. To complete the analysis, we should also mention that, when assuming replacement rates in the US to be high enough, even though this is not backed by current legislature, or that the Hosios condition is fulfilled ($\beta = \eta = 0.72$), we will find a procyclical entitlement duration rule optimal as in the European case, while the opposite – i.e. a countercyclical rule optimal for Europe – will never hold. This is because sufficiently high replacement rates or sufficiently great bargaining power of workers in the US case no longer necessitate strengthening the worker along the cycle as he is, then, already strong enough (or even too strong) following the logic of the Hosios condition.

3.4. Extensions and discussion of the results

There are several obvious issues that could conflict with our findings. So far, we have not addressed them sufficiently.

First, one could argue that adaption of entitlement length should – especially under distortionary taxation – be deficit financed. We can conduct the same analysis as above including tax distortions as well as debt, b_t, into the government's budget constraint. In order to prevent debt from being explosive and rule out Ponzi games, taxes have to adapt to the level of debt, however. Following the literature, we assume a tax rule $\hat{\tau}_t = \rho^t \cdot \hat{\tau}_{t-1} + (1-\rho^t)\phi_b \hat{b}_{t-1}$, in which ρ^t is a tax smoothing parameter and ϕ_b the parameter indicating how strongly taxes react to debt movements. As we do not have a clear knowledge of the parameter values for the tax rule when parameterizing the model, we refer to the literature on optimal fiscal policy. It basically derives two, say, "stylized" results. First, it seems preferable to adjust fiscal instruments by a small amount permanently to service a new higher level of debt, rather than change them by a large amount on a temporary basis to return debt to its initial level (see, for example, Schmitt-Grohé and Uribe, 2007; Kirsanova and Wren-Lewis, 2007; and Canzoneri et al., 2008; among others). This finding can be related to the tax smoothing argument (see Barro, 1979; and Lucas and Stokey, 1983). Second, mild countercyclical policy responses have a stabilizing and welfare-enhancing effect (see also Leith and Wren-Lewis, 2007; Straub and Tchakarov, 2007; or Gali and Monacelli, 2008). Therefore, we opt for a relatively high degree of tax smoothing and low debt reaction and set $\rho^t = 0.8$ and $\phi_b = 0.05$ for both countries. This analysis does not alter our results qualitatively. It even strengthens the basic argument because deficit financing implies giving the household more income now while taxing him later to finance this additional income when the economic situation improves.

Second, one could argue that productivity itself depends on the state of the economy or the labor market due to some hysteresis or "learning-by-doing" mechanism as described in, for example, Ball (2009) or Aghion and Saint-Paul (1998). Indeed, if this mechanism is strong enough, we find that procyclical policy may be optimal even for an economy with a fairly flexible labor market such as the US. To clarify what we have done, let us come back to the variable h_t that we have assumed to be constant throughout the analysis. We will define it now as a variable capturing aggregate (productivity-enhancing) knowledge of the form

$$h_t = \left[\left(\frac{Y_{t-1}/N_{t-1}}{\bar{Y}/\bar{N}} \right)^{lam} \left(\frac{N_{t-1}}{\bar{N}} \right)^{akk} \right],$$

which increases during booms and decreases in recessions because, for example, employed workers build up and unemployed people lose skills.[12] The bar indicates steady-state values. If we conduct the same analysis as above for the US case, in which the welfare metric finds countercyclical entitlement duration optimal and parameterize the knowledge function $skill = lam = akk = 0.5$, the grid search now finds the optimal parameters $\rho^v = 0.6$, $\phi_y = -2.5$ and $\phi_u = 1.944$. This is clearly a procyclical rule. Hence,

[12] The functional form is borrowed from Aghion and Saint-Paul (1998) who state that a greater level of aggregate labor input L_{t-1} and/or productivity of labor due to some efficient reorganization of production activities will both increase the rate of knowledge accumulation. Certainly a whole lot of other functional forms are widely discussed in the literature (see, for example, Priesmeier and Stähler 2009; for an overview). We do not want to enter this discussion but only use this as an example to check the robustness of our results.

the fact that productivity itself may be influenced by the past situation is able to reverse our results for the US. It is, however, not clear how strong this effect is empirically.

Third, a more generous unemployment insurance system could increase match quality because the unemployment insurance system may encourage risk averse workers to take on more risk and not take any low productivity job whenever offered (see e.g. Acemoglu and Shimer, 2000). As we have assumed homogeneous households and firms in the model presented, this issue is not addressed in our analysis. If, however, prolonged entitlement duration in bad times implies that sufficiently more high productivity jobs are generated compared to a situation with constant entitlement duration, this effect may mean that countercyclical entitlement duration is optimal also for Europe. Empirically, Centeno (2004) and Centeno and Novo (2006), among others, identify such a possibly positive role for the unemployment insurance system.

Fourth, we have assumed constant search effort by households. If we make it endogenous, we can expect two opposing effects. On the one hand, the deteriorated labor market situation should make households increase their efforts to find a new job, in general. On the other hand, however, this increase in search effort is certainly weakened whenever a countercyclical entitlement duration policy is pursued. If this decrease is strong enough, it may be optimal, under the welfare metric, to follow a procyclical rule similar to the knowledge accumulation function even when the labor market is quite flexible. Related to this issue – but with the opposite result – may be the fact that, during recessions, the bargaining power of workers could weaken compared to the steady-state situation. Once the weakening is strong enough, it may be the case that a countercyclical entitlement duration rule is identified as optimal also for Europe. The same holds where people in the first pillar of the insurance system face a better matching efficiency due to, for example, stigma effects of unemployment.

Other issues not directly connected to the model but still able to alter/reverse our findings are the difficulty to accurately identify the current economic situation and political incentives. Trend output and employment and, thus, corresponding deviations are assumed to be known immediately by the agents in our model. In praxis, the evaluation is certainly a very difficult if not impossible task (as Döpke, 2004; puts it "*it may not always be advisable to listen to the majority of forecasters*") but indispensable to follow the rules we have identified. Furthermore, we have neglected political incentives in the current model. While it is certainly always easy to prolong entitlement duration in bad times, cutting it back is unlikely to happen. Furthermore, the model is calibrated to the data following recent – but past – economic literature. As the parametric choice, including the desire for smoothing (i.e. risk aversion) may have changed in the current downturn, this may strengthen the argument for countercyclical policy (e.g. Jung and Kuester, 2009; show how the welfare costs of business cycles may differ for different parametric choices).

We leave the more sophisticated analysis of all these issues for further research, but we think that it is important that they are mentioned in order to put the current analysis into perspective and point out that there are several effects with the ability to change our results. Still, we think that the present paper is a good starting point for analyzing the issue in a business cycle context.

4. Conclusions

In this paper, we built have a conventional real business cycle model with a frictional labor market in order to address the question of whether countercyclically adapting entitlement duration for unemployment benefits, which is being discussed in the current downturn, is a good idea. Unemployment insurance is divided into two stages. In the first pillar, unemployed agents receive premium benefits which are cut (potentially to zero) once they move into the second pillar after a certain period of time.

We find that countercyclical entitlement duration does indeed harm labor market adjustment in bad times as it increases average unemployment benefit per unemployed worker and wages. Thus, employment falls compared to a situation with constant entitlement duration. However, due to households' desire to smooth consumption, this may still be welfare-enhancing as long as the labor market is flexible enough to cope with this situation comparatively well, i.e. employment losses are not too large. Otherwise, a procyclical entitlement length may be more appropriate.

Calibrating the model to US and European data, we find that the US labor market tends to be flexible enough to cope with the situation such that a countercyclical stance in unemployment insurance is welfare-enhancing. For Europe, however, this is not the case because workers' bargaining power is already too high relative to labor market flexibility.

The findings of the analysis seem to be quite robust to alternative specifications. However, once we include strong enough hysteresis or endogenous search effort effects, results may change implying that countercyclically adapting entitlement duration is no longer optimal even for the US economy. By contrast, when search effort is endogenous, more generous unemployment insurance augments match quality or the bargaining power of workers positively depends on the labor market situation, a countercyclical rule may be optimal also for Europe. Furthermore, we have neglected the fact that identifying the current cyclical situation may not be easy in praxis and that political incentives mean that cutting entitlement duration in good times is probably unlikely to happen. Another issue may be the calibration of the model, which is in line with recent – but still past – economic literature, while the parameters may have changed during this crisis.

Appendix

A. Deriving unions' marginal utility

From the households' perspective, the evolution of employment as well as first and second-pillar unemployment is given by equations (8) to (10). Households' marginal utility of having a member employed, or in the first and the second pillar of the unemployment insurance system is given by the corresponding derivation of equation (1), given equation (2), subject to the budget constraint equation (3) and the evolution of employment and unemployment. Let us define v_t^N, $v_t^{U^s}$ and $v_t^{U^l}$ as the Lagrangian parameters on the evolution of employment, short-term unemployment and long-term unemployment, respectively. Note that, in analogy to the firms' problem, these Lagrangians give households' marginal utility. The first-order conditions read

$$\text{for } N_t\text{:} \quad -\kappa^N N_t^{\sigma_N} + \lambda_t(w_t - \tau_t) - v_t^N + \beta E_t\left\{\left[(1-s)v_{t+1}^N + s v_{t+1}^{U^s}\right]\right\} = 0,$$

$$\text{for } U_t^s\text{:} \quad \lambda_t \kappa^B - v_t^{U^s} + \beta E_t\left\{\left[p_t v_{t+1}^N + (1 - p_t - \vartheta_t) v_{t+1}^{U^s} + \vartheta_t v_{t+1}^{U^l}\right]\right\} = 0$$

and

$$\text{for } U_t^l\text{:} \quad \lambda_t b - v_t^{U^l} + \beta E_t\left\{\left[p_t v_{t+1}^N + (1-p_t) v_{t+1}^{U^l}\right]\right\} = 0.$$

Hence, we we can derive

$$V_t^N = w_t - \tau_t - \frac{\kappa^N}{\lambda_t} N_t^{\sigma_N} + \beta E_t\left\{\frac{\lambda_{t+1}}{\lambda_t}\left[(1-s)V_{t+1}^N + s V_{t+1}^{U^s}\right]\right\}$$

as the marginal utility of employment,

$$V_t^{U^s} = \kappa^B + \beta E_t\left\{\frac{\lambda_{t+1}}{\lambda_t}\left[p_t V_{t+1}^N + (1 - p_t - \vartheta_t) V_{t+1}^{U^s} + \vartheta_t V_{t+1}^{U^l}\right]\right\}$$

as the marginal utility of unemployment in the premium pillar of the insurance system and

$$V_t^{U^l} = b + \beta E_t\left\{\frac{\lambda_{t+1}}{\lambda_t}\left[p_t V_{t+1}^N + (1-p_t) V_{t+1}^{U^l}\right]\right\}$$

as the marginal utility of unemployment in the second pillar, where $V_t^k = \frac{v_t^k}{\lambda_t}$, $k = N, U^s, U^l$. Using this, we see that $\left(V_t^{U^s} - V_t^{U^l}\right)$ as given in the main text, section 2.2.3. Defining $V_t^U = \gamma_t V_t^{U^s} + (1-\gamma_t) V_t^{U^l}$ as the (per worker average) utility of unemployment and $W_t = V_t^N - V_t^U$ as the "union's utility" (resulting from the average difference between working and unemployment), we can derive equation (16).

References

ACEMOGLU, D. AND R. SHIMER [2000], "Productivity Gains from Unemployment Insurance," *European Economic Review*, 44, 1195–1224.

AGHION, P. AND G. SAINT-PAUL [1998], "Uncovering Some Causal Relationships Between Productivity Growth and the Structure of Economic Fluctuations: A Tentative Survey," *Labour*, 12, 279–303.

ANDERSEN, T. M. AND M. SVARER [2009], "Business Cycle Dependent Unemployment Insurance," CEPR Working Paper, No. 7334, London.

ARULAMPALAM, W. AND M. STEWART [1995], "The Determinants of Individual Unemployment Duration in an Area of High Unemployment," *Economic Journal*, 105, 321–332.

BALL, L. M. [2009], "Hysteresis in Unemployment: Old and New Evidence," NBER Working Paper, No. 14818.

BARRO, R. J. [1979], "On the Determination of Public Debt," *Journal of Political Economy*, 87, 940–971.

BLANCHARD, O., C. COTTARELLI, A. SPILIMBERGO AND S. SYMANSKY [2008], "Fiscal Policy for the Crisis", IMF Staff Position Note, December 29, 2009, available at: http://www.imf.org/.

BOOTH, A. [1995], *The Economics of the Trade Union*, Cambridge University Press: Cambridge.

BURDA, M. AND M. WEDER [2002], "Complementarity of Labor Market Institutions, Equilibrium Unemployment and the Propagation of Business Cycles," *German Economic Review*, 3, 1–24.

BURDA, M. AND C. WYPLOSZ [1994], "Gross Worker and Job Flows in Europe," *European Economic Review*, 38, 1287–1315.

CAHUC, P. AND T. LE BARBANCHON [2008], "Labor Market Policy Evaluation in Equilibrium: Some Lessons of the Job Search and Matching Model," IZA Discussion Paper, No. 3687, Bonn.

CANZONERI, M. B., R. CUMBY, B. DIBA AND J. D. LÓOPEZ-SALIDO [2008], "Monetary and Fiscal Policy Coordination when Bonds Provide Transactions Services," CEPR Discussion paper Series, No. 6814.

CENTENO, M. [2004], "The Match Quality Gains from Unemployment Insurance," *Journal of Human Resources*, 39, 839–863.

CENTENO, M. AND A. A. NOVO [2006], "The Impact of Unemployment Generosity on Match Quality Distribution," *Economics Letters*, 93, 235–241.

CHRISTOFFEL, K., K. KUESTER AND T. LINZERT [2009], "The Role of Labor Markets for Euro Area Monetary Policy," *European Economic Review*, forthcoming.

COMMITTEE ON WAYS AND MEANS [2004], "The 2004 Green Background Material and Data on Programs within the Jurisdiction of the Committee on Ways and Means," US House of Representaives, 18^{th} edition, available at: http://www.waysandmeans.house.gov/Documents.asp?section=813/.

COOLEY, T. F. AND E. C. PRESCOTT [1995], "Economic Growth and Business Cycles," pp. 1–38 in: T. F. Cooley (ed), *Frontiers in Business Cycle Research*, Princeton University Press, Princeton, NJ.

COSTAIN, J. S. AND M. REITER [2005], "Stabilization versus Insurance: Welfare Effects of Procyclical Taxation under Incomplete Information," Bank of Spain, Working Paper, Madrid.

DÖPKE, J. [2004], "The Effects of Business Cycles on Growth - Time Series Evidence for the G7-countries Using Survey-based Measures of the Business Cycle," *CESifo Economic Studies*, 50, pp. 333–349.

DOMEIJ, D. AND M. FLODÉN [2006], "The Labor-Supply Elasticity and Borrowing Constraints: Why Estimates are Biased," *Review of Economic Dynamics*, 9, 242–262.

FLINN, C. J. [2006], "Minimum Wage Effects on Labor Market Outcomes under Search, Matching, and Endogenous Contact Rates," *Econometrica*, 74, 1013–1062.

GALI, J., J. D. LOPEZ-SALIDO AND J. VALLES [2007], "Understanding the Effects of Government Spending on Consumption," *Journal of the European Economics Association*, 5, 227–270.

GALI, J. AND T. MONACELLI [2008], "Optimal Monetary and Fiscal Policy in a Currency Union," *Journal of International Economics*, 76, 116–132.

GARIBALDI, P. AND L. G. VIOLANTE [2005], "The Employment Effects of Severance Payments with Wage Rigidities," *The Economic Journal*, 115, 799–832.

GOERKE, L., M. PANNENBERG, AND H. W. URSPRUNG [2007], "A Positive Theory of the Earnings Relationship of Unemployment Benefits," IZA Discussion Paper, No. 3003, Bonn.

HANSEN, G. D. [1985], "Indivisible Labor and the Business Cycle," *Journal of Monetary Economics*, 16, 309–327.

HOBIJN, B. AND A. SAHIN [2007], "Job-Finding and Separation Rates in the OECD," Staff Report No. 298, Federal Reserve Bank of New York, New York.

HOSIOS, A. J. [2001], "On the Efficiency of Matching and Related Models of Search and Unemployment," *Review of Economic Studies*, 57, pp. 279–298.

JUNG, P. AND K. KUESTER [2009], "The (Un)Importance of Unemployment Fluctuations for the Welfare Cost of Business Cycles," Federal Reserve Bank of Philadelphia, Working Paper, No. 08-31/R, Philadelphia, PA.

JURAJDA, S. AND F. J. TANNERY [2003], "Unemployment Durations and Extended Unemployment Benefits in Local Labour Markets," *Industrial and Labor Relations Review*, 56, 324–348.

KILEY, M. T. [2003], "How Should Unemployment Benefits Respond to the Business Cycle?," *Topics in Economic Analysis and Policy*, 3, 1–20.

KIM, J. AND K. S. KIM [2003], "Spurious Welfare Reversals in International Business Cycle Models," *Journal of International Economics*, 60, 471–500.

KIRSANOVA, T. AND S. WREN-LEWIS [2007], "Optimal Fiscal Feedback on Debt in an Economy with Nominal Rigidities," mimeo, University of Exeter, Exeter, Devon, UK.

KRAUSE, M. U. AND T. A. LUBIK [2007], "The (Ir)Relevance of Real Wage Rigidity in the New Keynesian Model with Search Frictions," *Journal of Monetary Economics*, 54, 706–727.

LEITH, C. AND S. WREN-LEWIS [2007], "Countercyclical Fiscal Policy: Which Instrument is Best?," Working Paper, University of Glasgow, Department Working Papers, No. 2005/03, extended version of The Cost of Fiscal Inflexibility.

LUCAS, R. [1987], "*Models of Business Cycles*," Blackwell, Oxford.

LUCAS, R. AND N. STOKEY [1983], "Optimal Fiscal and Monetary Policy in an Economy Without Capital," *Journal of Monetary Economics*, 12, 55–93.

MORTENSEN, D. T. AND C. PISSARIDES [1999], "New Developments in Models of Search in the Labor Market," pp. 2567–2627 in: O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Vol. 3B, Elsevier, Amsterdam.

OBSTFELD, M. [1994], "Evaluating Risky Consumption Paths: The Role of Intertemporal Substitutability," *European Economic Review*, 38, 1471–1486.

OECD [2009], "Economic Outlook," Paris.

OSWALD, A. J. [1982], "The Microeconomic Theory of Trade Unions," *The Economic Journal*, 92, 576–595.

OSWALD, A. J. [1993], "Efficient Contracts on the Labour Demand Curve: Theory and Evidence," *Labour Economics*, 1, 85–113.

OTROK, C. [2001], "On Measuring the Welfare Cost of Business Cycles," *Journal of Monetary Economics*, 47, 61–92.

PENCAVEL, J. H. [1991], *Labor Markets under Trade Unionism*, Blackwell.

PETRONGOLO, B. AND C.A. PISSARIDES [2001], "Looking into the Black Box: A Survey of the Matching Function," *Journal of Economic Literature*, 39, 390–431.

PISSARIDES, C. [2000], "*Equilibrium Unemployment Theory*," MIT Press, second edition, Cambridge, MA.

PRIESMEIER, C. AND N. STÄHLER [2009], "Long Dark Shadows or Innovative Spirits? The Effects of (Smoothing) Business Cycles on Economic Growth: A Survey of the Literature," mimeo.

RØED, K. AND T. ZHANG [2005], "Unemployment Duration and Economic Incentives – A Quasi-Random-Assignment Approach," *European Economic Review*, 49, 1799–1825.

ROGERSON, R. [1988], "Indivisible Labor, Lotteries and Equilibrium," *Journal of Monetary Economics*, 22, 3–16.

SANCHEZ, J. [2008], "Optimal State-Contingent Unemployment Insurance," *Economics Letters*, 98, 348–357.

SCHMITT-GROHÉ, S. AND M. URIBE [2007], "Optimal Simple and Implementable Monetary and Fiscal Rules," *Journal of Monetary Economics*, 54, 1702–1725.

SHIMER, R. [2005], "The Cyclical Behavior of Equilibrium Unemployment and Vacancies," *American Economic Review*, 95, 25–49.

SINKO, P. [2004], "Subsidizing versus Experience Rating of Unemployment Insurance in Unionized Labor Markets," *FinanzArchiv*, 60, 186–204.

SMETS, F. AND R. WOUTERS [2003], "An Estimated Stochastic General Equilibrium Model of the Euro Area," *Journal of the European Economic Association*, 1, 1123–1175.

STÄHLER, N. [2008], "Unemployment and Employment Protection in a Unionized Economy with Search Frictions," *Labour*, 22, 271–289.

STRAUB, R. AND I. TSCHAKAROV [2007], "Assessing the Impact of a Change in the Composition of Public Spending: A DSGE Approach," ECB Working Paper Series, No. 795, Frankfurt am Main.

SZ (SÜDDEUTSCHE ZEITUNG) [2009], "*Arbeitslosengeld länger auszahlen*," July 18, 2009, available at: http://www.sueddeutsche.de/wirtschaft/595/481071/text/.

TALLARINI, T. [2000], "Risk Sensitive Real Business Cycles," *Journal of Monetary Economics*, 45, 507–532.

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