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Incentives and Complementarities of Flexicurity

Alessio J. G. Brown, Christian Merkl and Dennis J. Snower

Abstract:

This paper analyses how and to which degree the Danish flexicurity concept and its various elements achieve the renowned Danish miracle by evaluating their unemployment and inequality effects and their complementarities. We develop a microfounded model of searching workers and firms, calibrate it to Germany and perform the policy experiment of implementing the full Danish flexicurity set of policies (low employment protection, high unemployment benefits and workfare). Our results show that implementing the Danish flexicurity concept in Germany would reduce unemployment and earnings inequality substantially. Furthermore our analysis illustrates that the Danish flexicurity policies have some apparent complementarities in Germany - the reduction of unemployment effect is nearly 40% greater when the policies are implemented in conjunction than in isolation.

Keywords: flexicurity; workfare, firing costs; employment; unemployment;

JEL Codes: J64, J65, E24, J22, J32

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1 Introduction

The Danish miracle of low and stable unemployment has been attributed to the Danish labour market policy of flexicurity, which combines very flexible labour markets, i.e. low job security, with generous unemployment support and active labour market policies. Consequently, the Danish flexicurity has drawn substantial attention and been praised as a role model by the ILO (e.g. Auer , 2000, Auer and Casez, 2003 and Egger et al., 2003) and by the OECD (e.g. OECD, 2004b). Also the European Commission has embraced the broader concept of flexicurity by developing guidelines for national flexicurity reforms.[1]

This paper analyzes how and to which degree the Danish flexicurity concept and its various elements achieve a low unemployment rate and thus, a higher employment security. Since the various policy components of flexicurity interact with eachother, it is essential not to examine these policies in isolation, but to evaluate their relative importance by exploring their complementarities and substitutabilities. This analysis will provide significant insights on the role and composition of flexicurity in achieving low unemployment as well as for the implementation of the Danish model in other countries.

To understand the interactions between these three components of flexicurity we develop a microfounded model of searching workers and employing firms, calibrate it to Germany and perform the policy experiment of implementing the full Danish Flexicurity set of policies in Germany, namely low employment protection, high unemployment benefits and active labour market policies, specifically workfare activation requirements, which are seen as the decisive element (Andersen and Svarer, 2007 and 2008). We analyze the unemployment and inequality effects of the set of policies as well as the single policies and their complementarities.

Flexible labour markets enable firms to adapt flexibly to face the challenge of world competition. In exchange for their job security workers receive generous unemployment support (income security) which is combined with workfare policy to strengthen employment incentives and ensure workers' employment. This set of policies not only implies strong economic complementarities, as our analysis shows, but also entails political complementairites in the sense that the ability to gain political consent for one policy depends on the acceptance of other policies (see Orszag and Snower, 1998). Political implementation of broad labour market reforms is often opposed to if the burden is placed narrowly on a specific group of workers. The joint implementation of the flexicurity policies directly addresses distributional consequences of more flexible labour markets, which are spread through the whole workforce, by providing more generous income support. These political complementarities might generate stronger support for this reform. At the same time the active labour market policies, esp. the workfare activation requirements put workers' employment incentives back in place and generate strong economic complementarities and, thus, enable the sustainability of the flexicurity policy.

Our results show that implementing the Danish flexicurity concept in Germany would reduce unemployment by 50% and would significantly reduce earnings inequality. Furthermore our analysis illustrates that the Danish flexicurity policies have some apparent complementarities in Germany, in the sense that the reduction of unemployment effect is approx. 40% greater when the policies are implemented in conjunction than in isolation. The strongest economic complementarities in reducing unemployment are generated by the joint implementation of higher unemployment benefits and the introduction of workfare. Flexible firing rules and workfare are not complementary at all, while flexible firing rules and higher unemployment benefits are weak.

[1] Specifically, the European Commission has developed a common set of flexicurity principles, endorsed by the European Council (European Commission, 2007 and Council of the European Union, 2007) to guide national reforms as well as flexicurity pathways (European Expert Group on Flexicurity, 2007) as different avenues member countries can follow to reform their labour markets.

The remainder is structured as follows: Section 2 discusses the flexicurity concept, its transferability and relates our work to the existing literature. Section 3 presents the theoretical labour market model. Section 4 calibrates the model for Germany, shows and discusses the single and joint effects of the flexicurity policies and their complementarities. Finally, Section 5 concludes.

2 Flexicurity

Danish flexicurity is seen as variant of a wider concept which encompasses various existing combinations.[2] Wilthagen and Tros (2004) summarize the various dimensions of flexibility (external numerical, internal numerical, functional and flexible pay) and security (job security, income security, employment and combination security[3]) in a matrix. While the discussion on flexicurity triggered a vast literature on this topic, it has not resulted in a consensus definition. It is either seen as a result of the evolution of labour market institutions and social dialogue (Bredgaard et al., 2006, Madsen, 2006b) or as a policy strategy (Wilthagen, 1998, Wilthagen and Rogowski, 2002, Wilthagen and Tros, 2004, Wilthagen et al., 2004).

The flexicurity concept originated in the Netherlands in the mid 1990s when labour market regulation was reformed. The reform introduced flexible and atypical employment contracts which were entitled to similar social security and working condition rights as for standard employment contracts.[4] As the Dutch version, Danish flexicurity focuses on external numerical flexibility and stemmed from a social dialogue. Danish flexicurity is a result of the combination of three central components, which form a "golden triangle" (Madsen, 2004):

1. very flexible labour markets, resulting from low employment protection for all employees - high external numerical flexibility,

2. extensive unemployment benefits providing income security to the unemployed - up to a replacement rate of 90% for low-skilled workers and

3. active labour market policies aimed at bringing workers back into employment - by strengthening employment incentives via activation and workfare requirements, by facilitating reintegration as well as by skills upgrading.[5]

Generally the idea behind flexicurity is that the two components flexibility and security are complementary policies. As Andersen and Svarer (2007) though point out these two elements have been part of the existing policy framework in Denmark since the mid 1970s, when unemployment was high and persistent. The low unemployment rate was achieved only when in the mid 1990s these two features were augmented by a third, namely active labour market policies, especially the introduction of workfare activation requirements.[6] This policy implied as shift from a focus on income security to one on employment security or as Torfing (1999) names it, a shift from a safety-net to a trampoline, which ensured the transition back to employment. Employment incentives were strengthened by reducing the 9 years of passive unemployment benefit entitlement successively to four years, with maximally 1 year of passive entitlement which is not renewable through activation as before.[7]

[2] For examples see e.g. Auer and Cazes (2003), Wilthagen and Tros (2004) and European Expert Group on Flexicurity (2007).

[3] I.e., the ability to combine work and private life.

[4] For the Dutch flexicurity see Wilthagen (1998), Wilthagen and Tros (2004), Van Oorschot (2004), Maarten (2008).

[5] Andersen and Svarer (2007) and Madsen (2008) point out these three key elements are aided by the other arms of the extensive Danish welfare state, e.g. a comprehensive educational service, encompassing adult vocational training and education, a well-functioning childcare system and publicly financed health care.

[6] For the Danish flexicurity and the labour market reforms see among many others Auer and Cazes (2003), Andersen and Svarer (2007), Zhou (2007), Madsen (2006a, b) and (2007).

[7] In line with this rights and duties approach benefit entitlements are lost if workers do not accept activation

Andersen and Svarer (2007) underline the point that this reform and the introduction of workfare had a decisive effect on unemployment and motivated by the Danish flexicurity Andersen and Svarer (2008) look exclusively at the sole role of workfare on unemployment within a search and matching framework with exogenous separations. It is admissible to use the search and matching framework of Mortensen and Pissarides (1999) to analyze labour market policies, provided that these policies have no significant influence on the matching process itself. However, it seems implausible that active labour market policies should have no effect on the matching process. To avoid running afoul of the Lucas Critique, we do not take this short-cut but derive the policy effects microfoundedly from the intertemporal maximization of economic agents and model their incentives explicitly. Additionally, while examining the interplay between all elements of the Danish flexicurity, we use an endogenous job destruction rate. Clearly, omitting this feature would bias the results.

In international comparisons the Danish employment security was perceived very high (Auer and Cazes, 2003) and at the same time the Danish flexicurity generated the lowest European inequality (Dennis and Guio, 2004). Consequently the issue of transferability of Danish flexicurity receives a lot of attention. Some authors (Bredgaard et al, 2005, and Andersen and Svarer, 2007) regard the transfer of Danish flexicurity into other countries as a quick and dirty copy-and-paste approach which neglects complex political, historical and social preconditions.[8] We wish to point out that balancing flexible firing rules and workfare requirements with higher unemployment benefits provides the ability to gain political consent for the full set of policies. And in the lines of Coe and Snower (1997) thereby, the flexicurity concept as a broad labour market reform policy exploits the political complementarities among individual policy measures. The focus in this paper though lies on the economic complementarities of the flexicurity policies.

In a political-economic model Boeri et al.(2006) analyze the emergence of labour market institutions, specifically, combinations of employment protection legislation strictness and generosity of unemployment benefits. They report that a flexicurity composition arises when wage differentials are significant or the unemployment benefit system sufficiently generous and progressive to generate consent to such a flexicurity policy strategy. The authors though completely neglect active labour market policies which according to Andersen and Svarer (2007) and many others were the decisive component in achieving Denmark's low unemployment rate.

Algan and Cahuc (2006) argue that the feasibility of the Danish flexicurity model is strongly dependent on the public-spiritedness of the workers. They theoretically analyze the implication of feelings of guilt due to workers cheating on unemployment benefits for the design of labour market institutions. They illustrate that the higher these feelings of guilt, the lower will be the employment protection, the higher the unemployment benefits and the higher the labour market participation. Furthermore, in their empirical analysis the authors show that civic attitudes depend on cultural values and thus, can not be easily changed by reforming labour market institutions. They thereby conclude that the implementation of flexicurity necessitates a comprehensive policy, thereby affecting civic behaviour of its citizens. The authors did not take into account the third element of the Danish flexicurity model, the active labour market policy, especially the activation requirements we consider in our analysis, which completes a comprehensive flexicurity policy package which could change civic behaviour.

Also Zhou (2007) addresses the question whether it is feasible and desirable to transfer the Danish flexicurity model to other countries. He empirically examines to what extend the components of flexicurity have contributed to the low unemployment rate. Regarding the single effects of the components the author qualitatively achieves similar results as in our analysis,

offers.

[8] Further transferability issues as optimal sequencing and institutional capacity are pointed out by Wilthagen (2005) and Zhou (2007).

but he completely disregards any complementarities in his analysis. In the theoretical model of Zhou (2008) and (2007) the author adopts a simple theoretical two equation model which he calibrates to the French economy to analyze the feasibility of financing the Danish concept. He concludes that the implementation from a high unemployment level is very costly and implies very limited short-run reductions of unemployment. In contrast to his analysis our approach employs a richer and microfounded model which also incorporates the government budget but in which the transition probabilities between the various labour market states depend on workers' incentives. This model will enable us to analyze the effect of the single policies and their complementarities on workers' employment incentives, thereby, their transitions and finally, the feasibility of the Danish flexicurity concept in Germany.

In the following Section we will derive this model.

3 The Model

We construct a Markov model of the labour market in which the dynamics of employment and unemployment are determined by transition probabilities among various labour market states. We derive these transition probabilities from optimization principles.

Our model is meant to be both rich enough to capture endogenous wage bargaining, hiring and firing as well as household search, but it also aims to be simple enough to generate straightforward, intuitively transparent, policy guidelines. Accordingly, our model involves some judicious compromizes between analytical simplicity and the depiction of heterogeneous labour market behaviour of workers and firms. The model structure is closely related to Brown et al.(2007a),[9] specifically, it extends their firm side and wage bargaining with household search, as in Brown et al. (2008).

Specifically, our model contains workers in three labour market states:

1. the *employed* (N),
2. the *unemployed* (U) ,who are not activated, yet,
3. the *activated* (A), who are unemployed workers in activation, specifically in workfare programmes.

Our model describes labour market activity for workers as a Markov process involving these three states. Apart from the probability of activation which is a policy variable, the transition probabilities among these states are derived from microeconomic foundations.

We assume constant returns to labour. Let $q\epsilon^N$ be the labour productivity of an employee, where ϵ^N is the work effort of the employed worker.[10] The firm faces a random cost ε_t, which is iid across workers and time. This cost may be interpreted as, say, an operating cost or a negative productivity shock. Its mean is normalized to zero and its cumulative distribution $\Gamma(\varepsilon_t)$ is time-invariant.

Workers' instantaneous utility $\upsilon_t(c_t, l_t)$ depends on comsumption c_t and leisure l_t, where the time endowment is normalized to 1. For simplicity we assume that workers consume all their income. Employed workers receive a wage w_t and pay payroll taxes with a rate of τ_t and unemployed workers receive unemployment benefits b_t. Employed workers provide work effort ϵ^N, which creates disutility as it restricts the available time for leisure. Unemployed workers divide their time between leisure and job search e_t^U. Activated unemployed workers

[9] See also Snower and Merkl (2006). Lechthaler et al. (2008) included this model into a DSGE framework.

[10] We follow the notational convention that only those variables have time subscripts that actually vary through time in our model.

(A) in addition to searching for a job e_t^A have to provide the required workfare effort ϵ^A.[11] Furthermore, in line with Andersen and Svarer (2008) we allow the utility function of employed workers (N) to differ from the unemployeds' $(U,\ A)$ to capture potential stigmatisation effects of unemployment.

Agents in our model pursue the following sequence of decisions. First the government sets its policy variables and balances its budget. Second, workers make their search decision. Third, the operating costs are revealed. Then, wages are determined through bargaining and fourth, firms make their employment decisions.

3.1 Government Budget

Our model considers 4 instruments of government policy:

(i) a proportional payroll tax, with a tax rate τ_t, paid by all employed workers, set to balance the governments' budget,

(ii) unemployment benefits b_t, paid to all unemployed workers,

(iii) legislation on the flexibility of the labour market, i.e. firing costs f_t, at no expense,

(iv) active labour market policy[12] in form of workfare activation, specifically, unemployed workers are required to participate in workfare programmes to remain eligible for unemployment benefits, with an activation probability α_t and a work requirement ϵ_t^A which creates some costs κ_t[13] per activated worker.[14]

Assuming a constant labour force L the government budget is given by

$$n_t w_t \tau_t = (a_t + u_t) b_t + a_t \kappa_t \tag{1}$$

where w_t is the wage, n_t, u_t, a_t the rate of workers employed, passively unemployed and activated, respectively.

3.2 Transitions Among Labour Market States

The transitions among the labour market states are summarized in Figure 4.1.[15] For analytical simplicity, we choose to describe these transitions in terms of a small number of transition variables.

The unemployed (U) are matched with probability μ^U and then become employed; alterntatively if they are not matched with probability $\left(1-\mu^U\right)$ they are activated with probability α[16] and enter workfare programmes; with the probability $(1-\alpha)\left(1-\mu^U\right)$ they remain unemployed on passive benefits. The activated workers are matched with probability μ^A and then become employed (N); with probability $\left(1-\mu^A\right)$ they are not hired and remain unemployed and in activation. At the end of a period, new hires turn into insiders. As insiders, they lose their jobs with probability ϕ and then become unemployed; with probability $(1-\phi)$ they are retrained.[17]

[11] Thus, leisure time is the time which is not spent working, being on workfare or searching for a job: $l_t^A = 1-\epsilon_t^A-e_t^A$, $l^N = 1-\epsilon^N$, $l_t^U = 1-e_t^U$.

[12] For simplicity in our model active labour market policy does not affect workers' human capital, thereby we bias the model against us.

[13] For simplicity we assume that the effort on workfare does not influence the cost of workfare.

[14] We assume that workers who are activated will always accept going on workfare since otherwise they would suffer severe reductions in unemployment benefits.

[15] To simplify notation, we suppress the subscripts refering to time (t) here.

[16] Frederiksson and Holmund (2006) argue that a fixed time duration of activation can be approximated by a stochastic transition into activation.

[17] Entrants turn into insiders at the end of a period. In case they are fired at the beginning of the next period these entrants have been insiders just for an instant.

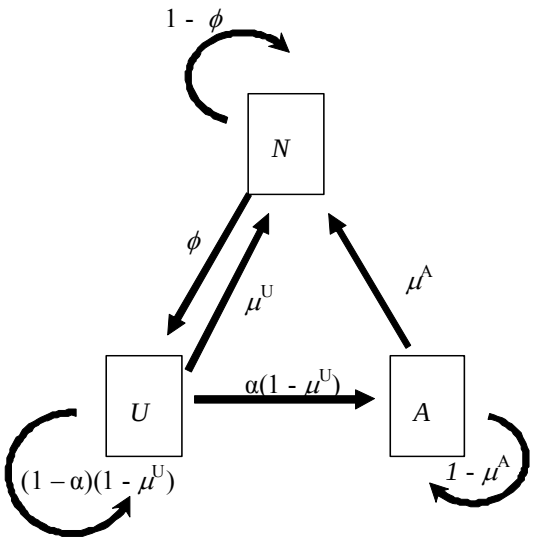

Figure 1: Labour market flows.

Thus the labor market system in period t may be described as follows:

$$S_t = T_t S_{t-1} \tag{2}$$

where S_t is a vector of the labor market states:

$$S_t = \left(N_t^I, N_t^E, U_t, A_t\right)' \tag{3}$$

and T_t is a Markov matrix of transition probabilities:

$$T_t = \begin{array}{ccc} (1-\phi_t) & \mu_t^U & \mu_t^A \\ \phi_t & (1-\alpha_t)\left(1-\mu_t^U\right) & 0 \\ 0 & \alpha_t\left(1-\mu_t^U\right) & (1-\mu_t^A) \end{array} \tag{4}$$

We now proceed to derive the transition probabilities from microeconomic foundations.

3.3 Households' Search Decisions

As noted, workers' utility v_t depends on comsumption and leisure. As pointed out above workers can be employed (N) or unemployed and when unemployed, they can be on passive benefits (U) or activated in workfare programmes (A). The passive unemployed (U) and the activated unemployed (A) workers determine the amount of effort e_t^U, e_t^A they expend in searching for a job. The probability of an unemployed or activated unemployed worker being employed depends on his search intensity (i.e. the length of time unemployed workers spent searching). The harder unemployed search for a job relative to the other workers the more likely they are to find a a firm, which is hiring.[18] Thus, an unemployed worker's job expected finding probability $E_t\left(\mu_t^U\right)$ is

$$E_t\left(\mu_t^U\right) = \zeta \frac{e_{t-1}^U}{\bar{e}_{t-1}} E\left(\eta_t\right), \tag{5}$$

and an activated unemployed worker's expected job finding probability μ_t^A is

[18] There is no on-the-job search.

$$E_t\left(\mu_t^A\right) = \zeta \frac{e_{t-1}^A}{\bar{e}_{t-1}} E\left(\eta_t\right), \tag{6}$$

where η_t is the expected firm's hiring rate, ζ is a scale parameter and $\bar{e}_t$ is the average amount of job search effort:

$$\bar{e}_t = \frac{\left(\sum_{i=1}^{U_t} e_{t,i}^U + \sum_{j=1}^{A_t} e_{t,j}^A\right)}{(U_t + A_t)} = \frac{\left(u_t e_t^U + a_t e_t^A\right)}{u_t + a_t} \tag{7}$$

and where U_t is the number of unemployed job searchers and A_t the number of activated job searchers and $u_t = \frac{U_t}{L}$ and $a_t = \frac{A_t}{L}$ are the respective rates given the constant labour force L. Thereby each household takes $\bar{e}_t$ as exogenously given when it makes its search decision.[19]

Workers choose the search effort which maximizes their expected present value of lifetime utility taking into account the effects of their leisure choices on the job finding rates.

A unemployed worker maximizes his expected present value of utility $E\left(V_t^U\right)$ over his search effort e_t^U :

$$E_t\left(V_t^U\right) = \max_{e_t^U} \upsilon_t^U\left(b_t, 1 - e_t^U\right) + \delta E_t \left(\begin{array}{c} \mu_{t+1}^U\left(e_t^U\right) V_{t+1}^N + \left(1 - \mu_{t+1}^U\left(e_t^U\right)\right) \alpha_{t+1} V_{t+1}^A \\ + \left(1 - \mu_{t+1}^U\left(e_t^U\right)\right)\left(1 - \alpha_{t+1}\right) V_{t+1}^U \end{array} \right), \tag{8}$$

where υ_t is the contemoraneous utility, which depends on consumption and leisure, δ is the discount factor, $E_t\left(V_{t+1}^U\right)$ and $E_t\left(V_{t+1}^A\right)$ an employed worker's and an activated unemployed workers's present value of utility in $t+1$, respectively, which are:

$$E_t\left(V_{t+1}^N\right) = E_t\left(\upsilon_{t+1}^N\left(w_{t+1}\left(1 - \tau_{t+1}\right), 1 - \epsilon^N\right)\right) + \delta E_t\left(\left(1 - \phi_{t+2}\right) V_{t+2}^N + \phi_{t+2} V_{t+2}^U\right), \tag{9}$$

$$E_t\left(V_{t+1}^U\right) = E_t\left(\upsilon_{t+1}^U\left(b_{t+1}, 1 - e_{t+1}^U\right)\right) + \delta E_t \left(\begin{array}{c} \mu_{t+2}^U\left(e_{t+1}^U\right) V_{t+2}^N \\ + \left(1 - \mu_{t+2}^U\left(e_{t+1}^U\right)\right) \alpha_{t+2} V_{t+2}^A \\ + \left(1 - \mu_{t+2}^U\left(e_{t+1}^U\right)\right)\left(1 - \alpha_{t+2}\right) V_{t+2}^U \end{array} \right), \tag{10}$$

and

$$E_t\left(V_{t+1}^A\right) = E_t\left(\upsilon_{t+1}^A\left(b_{t+1}, 1 - e_{t+1}^A - \epsilon_{t+1}^A\right)\right) + \delta E_t\left(\mu_{t+2}^A\left(e_{t+1}^A\right) V_{t+2}^N + \left(1 - \mu_{t+2}^A\left(e_{t+1}^A\right)\right) V_{t+2}^A\right). \tag{11}$$

Along the same line, an activated unemployed worker maximizes his present value of utility $E_t\left(V_t^A\right)$ over search effort e_t^A :

$$E_t\left(V_t^A\right) = \max_{e_t^A} \upsilon_t^A\left(b_t, 1 - e_t^A - \epsilon_t^A\right) + \delta E_t\left(\mu_{t+1}^A\left(e_t^A\right) V_{t+1}^N + \left(1 - \mu_{t+1}^A\left(e_t^A\right)\right) V_{t+1}^A\right). \tag{12}$$

[19] Note that we are assuming that the effort decisions of an entrant affects the probability of getting hired (relative to the probability that other job searchers get hired), but it does not affect the productivity of the entrants, once they are at work. In other words, the unemployed's effort decision affects the probability of getting hired, but not the productivity on the job.

The first-order conditions for these decision problems for the passive and activated unemployed, respectively, are:

$$-\upsilon_{e_t^U}^U = \frac{\delta\zeta E_t\left(\eta_{t+1}\right)}{\bar{e}_t} E_t\left(V_{t+1}^N - \alpha_{t+1}V_{t+1}^A - \left(1-\alpha_{t+1}\right)V_{t+1}^U\right)^{20} \tag{13}$$

$$-\upsilon_{e_t^A}^A = \frac{\delta\zeta E_t\left(\eta_{t+1}\right)}{\bar{e}_t} E_t\left(V_{t+1}^N - V_{t+1}^A\right). \tag{14}$$

In other words, the marginal utility of leisure must be set equal to the discounted marginal job finding propensity $\left(\frac{\zeta\delta E_t\left(\eta_{t+1}\right)}{\bar{e}_t}\right)$ times the *reward for seeking a job*. This reward is the difference between the expected present value of lifetime utility of being employed $E_t\left(V_{t+1.}^N\right)$ and the present value of lifetime utility of not finding a job. For activated workers the latter value corresponds to the the expected present value of lifetime utility of being an activated unemployed worker $E_t\left(V_{t+1.}^A\right)$, and for not activated unemployed workers it is equal to the weighted average of the expected present value of liftime utility of a passive and an activated unemployed $E_t\left(V_{t+1.}^N - \alpha_{t+1.}V_{t+1.}^A - \left(1-\alpha_{t+1.}\right)V_{t+1.}^U\right)$. The weights are given by the respective probabilities of being activated and remaining on passive benefits. Given diminishing marginal utility of leisure, the optimal leisure depends inversely on the reward for seeking a job.

Once workers have decided on their search effort, the idiosynchratic operating cost is revealed and insiders bargain for wages.

3.4 Wage Determination

For simplicity, let the wage w_t be the outcome of a Nash bargain between the median insider and her firm. Our wage bargaining model is analoguous to the median voter model, where the utility of the median voter is maximized. The firm bargains with a union which maximizes the utility of the median insider. When the bargaining decision takes place, nobody has been fired yet. The median insider is the worker who is situated exactly in the middle of the distribution and who faces no risk of dismissal at the negotiated wage. She has average operating costs normalized to zero. The wage is renegotiated in each period t.

Under bargaining agreement, the insider receives the wage $w_t(1-\tau_t)$ where τ_t is the payroll tax rate, and has some disutility from regular employment ϵ^N, and the firm receives the expected profit $\left(q\epsilon^N - w_t\right)$ in each period t. Thus the expected present value of the insider's utility $E_t\left(V_t^I\right)$[21] under bargaining agreement is

$$E_t\left(V_t^I\right) = \upsilon_t(w_t(1-\tau_t), 1-\epsilon^N) + \delta E_t\left(\left(1-\phi_{t+1}\right)V_{t+1}^I + \phi_{t+1}V_{t+1}^U\right) \tag{15}$$

where ϕ_{t+1} is the firing rate and V_{t+1}^U the expected present value of a unemployed workers' returns. The expected present value of firm's returns under bargaining agreement are

$$E_t\left(\Pi_t\right) = \left(\epsilon^N q - w_t\right) + \delta E_t\left(\left(1-\phi_{t+1}\right)\Pi_{t+1} - \phi_{t+1}f_{t+1}\right) \tag{16}$$

where f_t are firing costs.

[20] This can also be written as $-\upsilon_{e_t^U} = \frac{\delta\zeta\eta_{t+1}}{\bar{e}_t}\left(V_t^N - V_t^U - \lambda_t\left(V_t^A - V_t^U\right)\right)$. In absence of workfare, for $\lambda_t = 0$ this reduces to $-\upsilon_{e_t^U} = \frac{\delta\zeta\eta_{t+1}}{\bar{e}_t}\left(V_t^N - V_t^U\right)$.

[21] Please note that V_t^I, the expected present value of utility of an insider, is equal to V_t^N, that of an employed worker, as for simplicity there is no productivity differential between entrants and insiders.

Under disagreement insiders workers go on strike and cause a cost $-\theta f_t$ with $0 \leq \theta \leq 1$ to the firm up to short of inducing dismissal,[22] and the insider's fallback income is assumed for simplicity to be equal to the unemployment benefits b_t. Under disagreement the firm (goes to a secondary, temporary market and) tries to hire temporarily activated workers (in partial replacement of the workers on strike).[23] As it has to search for these workers, hiring of temporary workers takes place with the probability χ.

Assuming that disagreement in the current period does not affect future returns,[24] the present values of utility under disagreement for the insider are

$$E_t\left(V_t'^I\right) = \upsilon_t\left(b_t, 1\right) + \delta E_t\left(\left(1-\phi_{t+1}\right)V_{t+1}^I + \phi_{t+1}V_{t+1}^U\right) \tag{17}$$

and for the firm are

$$E\left(\Pi_t'^I\right) = -\theta f_t + \chi\left(\epsilon^A q - b_t\right) + \delta E_t\left(\left(1-\phi_{t+1}\right)\Pi_{t+1}^I - \phi_{t+1}f_{t+1}\right). \tag{18}$$

Thus, the insider's bargaining surplus is

$$E_t\left(V_t^I\right) - E_t\left(V_t'^I\right) = \upsilon_t(w_t(1-\tau_t), 1-\epsilon^N) - \upsilon_t\left(b, 1\right) \tag{19}$$

and the firm's surplus is

$$E_t\left(\Pi_t\right) - E_t\left(\Pi_t'\right) = \epsilon^N q - w_t + \theta f_t - \chi_t\left(\epsilon_t^A q - b_t\right) \tag{20}$$

The negotiated wage maximizes the Nash product (Λ):

$$\Lambda_t = \left(\upsilon_t^N(w_t(1-\tau_t), 1-\epsilon^N) - \upsilon_t^U\left(b_t, 1\right)\right)^{\gamma}\left(\epsilon^N q - w_t + \theta f_t - \chi\left(\epsilon^A q - b_t\right)\right)^{1-\gamma}, \tag{21}$$

where γ represents the bargaining strength of the insider relative to the firm, and satisfies:

$$1 = \frac{\upsilon_{t,w_t}^N \gamma\left(\epsilon^N q - w_t + \theta f_t - \chi_t\left(\epsilon_t^A q - b_t\right)\right)}{\left(1-\gamma\right)\left(\upsilon_t(w_t(1-\tau_t), 1-\epsilon^N) - \upsilon_t^U\left(b_t, 1\right)\right)} \tag{22}$$

3.5 Firms' Hiring and Firing Decisions

First consider the *firing rate ϕ_t for insiders*. An insider is associated with the wage w_t and the firing cost f_t. Let the time discount factor be δ. Recalling that the insider's productivity is $\epsilon^N q$, the expected present value of profit generated by an insider, after the random cost ε_t at time t is observed, is[25]

$$E_t\left(\pi_t^I\right) = \left(\epsilon^N q - w_t - \varepsilon_t\right) + \sum_{i=t+1}^{\infty}\delta^i\left(\begin{array}{c}\left(1-\phi_i\right)^i\left(\epsilon^N q - w_i - E_i\left(\varepsilon_i|\varepsilon_i < \nu_i^I\right)\right) \\ -\phi_i f_i(1-\phi_i)^{i-1}\end{array}\right), \tag{23}$$

so that

[22] This cost may be generated through activities such as picket lines, work-to-rule, sabotage, etc. Employed workers have an incentive to impose this cost if these activities per se are costless to them (but of course costly to the firm). The reason is that reducing the firm's fallback profit raises the bargaining rent, some of which is captured by the workers. However the incumbent workers have no incentive to drive the firm's fallback profit below $-f_t$, for then the firm would find it worthwhile to fire them.

[23] For this to happen, the following must hold $\epsilon^A q - b > 0$.

[24] Once an agreement has been reached, insiders go back to work and temporarily hired workers, who are in activation, are fired.

[25] In the first period, profit is $\left(q\epsilon^N - w_t - \varepsilon_t\right)$; in the second period, the insider is retained with probability $(1-\phi_t)$ and the insider is fired with a probability of ϕ_t and so on.

$$E_t\left(\pi_t^I\right) = \frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta\left(1-\phi_t\right) E_t\left(\varepsilon_t|\varepsilon_t < \nu_t^I\right)}{1-\delta\left(1-\phi_t\right)} - \varepsilon_t.^{26} \tag{24}$$

The expected incentive to retain the insider $\left(\nu_t^I\right)$ is defined as the difference between the expected goss profit from retaining the insider $\left(E_t\left(\pi_t^I\right) = \frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta(1-\phi_t)E_t\left(\varepsilon_t|\varepsilon_t<\nu_t^I\right)}{1-\delta(1-\phi_t)}\right)$[27] and the expected profit from firing him $(-f_t)$, i.e. this *insider retention incentive* is

$$\nu_t^I = \frac{\epsilon^N q - w_t + (1-\delta) f_t - \delta\left(1-\phi_t\right) E_t\left(\varepsilon_t|\varepsilon_t < \nu_t^I\right)}{1-\delta\left(1-\phi_t\right)} \tag{25}$$

An insider is fired in period t when the realized value of the random cost ε_t is greater than the insider employment incentive:[28] $\varepsilon_t > \nu_t^I$. Since the cumulative distribution of the operating cost is $\Gamma\left(\varepsilon_t\right)$, the insider's firing rate is

$$\phi_t = 1 - \Gamma\left(\nu_t^I\right) \tag{26}$$

Next consider the *hiring rate η_t for unemployed and unemployed, activated workers.* The expected present value of profit generated by an *entrant* (a worker who has been hired after being unemployed), after the random cost ε_t at time t is observed, is

$$E_t\left(\pi_t^E\right) = \left(\epsilon^N q - w_t - \varepsilon_t - h\right) + \sum_{i=t+1}^{\infty} \delta^i \begin{pmatrix} \left(1-\phi_i\right)^i \left(\epsilon^N q - w_i - E_i\left(\varepsilon_i|\varepsilon_i < \nu_i^U\right)\right) \\ -\phi_i f_i (1-\phi_i)^{i-1} \end{pmatrix}, \tag{27}$$

where h is the hiring cost, so that

$$E_t\left(\pi_t^E\right) = \frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta\left(1-\phi_t\right) E_t\left(\varepsilon_t|\varepsilon_t < \nu_t^U\right)}{1-\delta\left(1-\phi_t\right)} - \varepsilon_t - h. \tag{28}$$

The expected incentive to hire an entrant $\left(\nu_t^E\right)$ is defined as the difference between the expected gross profit from employing the entrant[29] and the expected profit from not doing so (i.e. zero). Thus the *unemployed hiring incentive* is

$$\nu_t^E = \frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta\left(1-\phi_t\right) E_t\left(\varepsilon_t|\varepsilon_t < \nu_t^U\right)}{1-\delta\left(1-\phi_t\right)} - h \tag{29}$$

An unemployed worker is hired in period t when the realized value of the random cost ε_t is less than the entrant hiring incentive:[30] $\varepsilon_t < \nu_t^E$. Thus the hiring rate for unemployed (passive and activated) is

$$\eta_t = \Gamma\left(\nu_t^E\right). \tag{30}$$

[26] $E_t\left(\varepsilon_t|\varepsilon_t < \nu_t^I\right)$ is the expected value of the operating cost conditional on being retained.

[27] The "gross" profit is expected profit generated by retaining him, without accounting for the operating cost.

[28] Equivalently, the insider is fired when the profit from retaining the insider is less than the firing cost $\frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta(1-\phi_t)E_t\left(\varepsilon_t|\varepsilon_t<\nu_t^I\right)}{1-\delta(1-\phi_t)} - \varepsilon_t < -f_t$.

[29] This "gross" profit is the expected profit generated by hiring an unemployed worker, without taking the operating cost into account.

[30] Equivalently, the entrant is hired when the profit from employing this worker is greater than than the hiring cost: $\frac{\epsilon^N q - w_t - \delta\phi_t f_t - \delta(1-\phi_t)E_t\left(\varepsilon_t|\varepsilon_t<\nu_t^U\right)}{1-\delta(1-\phi_t)} - \varepsilon_t > h$.

3.6 Employment, Unemployment and the Labour Market Equilibrium

The change in employment (ΔN_t) is the difference between the outflow from the total unemployment pool $\left(\mu_t^U U_{t-1} + \mu_t^A A_{t-1}\right)$ and the outflow from the employment pool ($\phi_t N_{t-1}$): $\Delta N_t = \mu_t^U U_{t-1} + \mu_t^A A_{t-1} - \phi_t N_{t-1}$. Assuming a constant labour force L and defining the employment rate to be $n_t = N_t/L_t$, we obtain the following *employment dynamics equation*:[31]

$$n_t = \mu_t^U u_{t-1} + \mu_t^A a_{t-1} + (1 - \phi_t)\, n_{t-1} \tag{31}$$

The passive unemployed comprise those workers who were unemployed in the previous period and who have neither been hired or activated in the current period and those who have been fired. Thus the passive *unemployment dynamics equation* is

$$u_t = \left(1 - \mu_t^U\right)(1 - \alpha_t)\, u_{t-1} + \phi_t n_{t-1} \tag{32}$$

The activated unemployment rate is the difference between 1 and the aggregate employment and unemployment rates:

$$\begin{aligned} a_t &= 1 - n_t - u_t \\ &= \left(1 - \mu_t^U\right)\alpha_t u_{t-1} + (1 - \mu_t^A) a_{t-1}.^{32} \end{aligned} \tag{33}$$

The labour market equilibrium is the solution of the system comprising

- the employment and unemployment dynamics, eqs. 31, 32, 33,
- the firing and hiring rate as well as the job finding rates, eqs. 26, 30, 5, 6,
- the entrant hiring incentive and the insider retention incentive, eqs. 29, 25,
- the search equations, eqs. 13, 14, 7,
- the negotiated wage, eq. 22, and
- the government budget constraint (eq. 1).

We now proceed to calibrate the model above for German data and analyze the effectiveness of Danish flexicurity on unemployment and inequality We will proceed as follows: first, the calibration, then the numerical results and an intuitive discussion of the policy effects.

4 Quantitative Evaluation

In this Section we evaluate the unemployment and inequality effects of implementing the Danish flexicurity concept in Germany. Our analysis shows that, for reasonable parameter values, the Danish flexicurity policy has huge incentive effects and sizeable complementarities in terms of unemployment. For our purpose, we specify particular functional forms for the behavioural relations above and calibrate the resulting model.

[31] Note that $\Delta n_t = \mu_t^U\,(1 - n_{t-1} - a_{t-1}) + \mu_t^A\,(1 - n_{t-1} - u_{t-1}) - \phi_t n_{t-1}$.

4.1 Specification

We start by specifying the functional forms: We assume a logistic distribution for the operating cost ε_t, such that the time-invariant cumulative density function is

$$\Gamma(\nu_t^{I,E}) = \left(\frac{1}{1 + e^{-\left(\nu_t^{I,E} - E(\varepsilon_t)\right)/s}} \right); \tag{34}$$

recall that due to normalisation $E(\varepsilon_t)$ is zero, s is the scale parameter of the distribution. In line with Andersen and Svarer (2008) and Fredriksson and Holmlund (2006) workers' utility is aditively separable as well as logarithmic in consumption and leisure and the function differs between employed and unemployed (non-activated and activated) workers:

$$\upsilon_t^{U,A}(c_t^{U,A}, l_t^{U,A}) = \ln c_t^{U,A} + \ln l_t^{U,A} \tag{35}$$

$$\upsilon_t^{N}(c_t^{N}, l_t^{N}) = \ln x c_t^{N} + \ln l_t^{N}, \tag{36}$$

where $x > 1$ is a non-monetary payoff from employment.[33] This yields the wage

$$w_t = \frac{\gamma\left(\left(\epsilon^N - \chi_t \epsilon_t^A\right) q + \theta f_t + \chi b_t\right)}{(1-\gamma)\ln(\frac{x w_t (1-\tau_t)(1-\epsilon^N)}{b_t}) + \gamma}. \tag{37}$$

For these functional forms, we now proceed to calibrate the resulting model.

4.2 Calibration

The period of analysis is one quarter. The quarterly interest rate r is set to yield a rate of 3% per year, which corresponds to the average money market rate over the last 10 years in Germany,[34] and we set the discount factor to $\delta = \frac{1}{1+r}$. Hiring costs are set to 60% of quarterly productivity as used by Mortensen and Pissarides (1999).[35]

We apply institutional features of the German labour market by calibrating the unemployment benefit in the steady state to $b_0 = \beta_0 w_0 (1 - \tau_0)$ with a net replacement rate for Germany of $\beta_0 = 0.62$[36] and quarterly firing costs relative to the wage to $f_0 = \rho_0 w_0$ with $\rho_0 = 2.4$, in line with yearly values provided by Chen and Funke (2003) and Bentolila and Bertola (1990).[37]

The unemployment rate is set to the standardized unemployment rate of Germany 2005, namely 0.095, see OECD (2007). Given this unemployment rate the quarterly job finding rate $\mu u_0 = 32\%$, taken from Wilke's (2005) Kaplan-Meier functions for Germany, yields a steady state firing rate of $\phi_0 = \frac{\mu u\, u}{n} = 3.4\%$. The free parameter $s = 1.68$ of the CDF of the operating costs and $\zeta = 0.36$ are set to match the job finding and the firing rate and generate a long-run wage elasticity of labour demand, which is within the range of -0.1 and -1.3 found for Germany, see Riphahn et al. (1999), specifically of -0.86.

Andersen and Svarer (2008) assume that workers spend 60% of their time at work (ϵ^N). The relative time use for effort and leisure of employed workers per weekday for Western Europe

[33] Thus, the utility of consumption for unemployed differs from that of employed. This can be interpreted e.g. as the converse of the circumstance that being unemployed negatively affects workers' subjective well being (stigmatising effects), see Krueger and Mueller (2008) also for previous research on this topic. Separability implies that leisure does not depend on current income.

[34] See Deutsche Bundesbank (2008).

[35] These costs consist of 30% recruiting and 30% training costs; see Mortensen and Pissarides (1999).

[36] For simplicity, we took the unweighted average across six family types as well as over the initial period of unemployment and long-term unemployment for 2005, see OECD (2008).

[37] Please note that variables and parameters with subscript "0" denote the value at the calibrated steady state for Germany, i.e. before any flexicurity policy exercise.

from Krueger and Mueller (2008) suggests a value for ϵ^N of 69%,[38] while the relative allocation in Freeman and Schettkat (2005) points at a value between 61-64%.[39] Similiarly, from the relative time use for effort and leisure of unemployed workers we can determine the effort of unemployed workers: the analysis of Krueger and Mueller (2008) suggests a value of 10%[40] and Freeman and Schettkat (2005) offer values from 11% to 18%.[41] In line with these studies we set $\epsilon^N = 65\%$ and $e_0^U = 15\%$. These values then yield the value for the utility paramter of $x \approx 1.84$. Furthermore, for simplicity q is normalized to 1 and we use a bargaining power γ equal to 0.6 which corresponds to the average of the values estimated for union bargaining power in Germany by Dumont et al. (2006). This in turns determines a value for $\theta \approx 0.03$. The resulting elasticity of the wage to firing costs with a value of 0.05 is very conservative compared to the results from van der Wiel (2008), which suggest a value of 0.1.[42]

With this calibration our model generates reasonable values for various elasticities which can be found in the literature: our calibration yields an elasticity of unemployment duration to unemployment benefits of -0.5, Hornstein et al. (2005) refering to various studies report values between -0.1 and -1.[43] Furthermore, the amplification mechanism of our calibrated model with an elasticity of unemployment to productivity of approximately -5 is nearer to the data than e.g. the standard search and matching model.[44]

Before the policy exercises a tax rate of $\tau_0 \approx 0.06$ balances the government's budget.

In the following policy exercise we apply Danish values to the poicy variables: the net replacement rate will be increased to the Danish level of $\beta_1 = 0.69$.[45] The firing cost parameter ρ for the policy exercise is set to $\rho_1 = 0.3$, which is suggested by the relative value (50%) of the employment protection indice of Denmark relative to Germany by the OECD (2004b) for regular employment as well as by Lazear (1990) in terms of severance pay.[46]

Andersen and Svarer (2007) point out that unemployed workers receive an activation offer not later than after 12 months of unemployment, thus we set $\lambda_1 = 0.25$. Furthermore, we assume that workfare requirements correspond to the work effort of employed workers, thus, we set $\epsilon_1^A = \epsilon^N = 65\%$ and will assume that the cost of workfare is comparable to the one

[38] Employed workers spend 395 minutes per weekday on the effort considered here - 395 for work and 0 for job search - and 179 minutes for leisure and socialising, see Table 3 from Krueger and Mueller (2008). Thus, employed workers divide their time in 69% effort and 31% leisure.

[39] Here we compare market work and leisure for women and men, respectively. Western Europe here comprises Netherlands, Italy and Austria. Freeman and Schettkat (2001) provide values for Germany but do not distinguish between employed and unemployed.

[40] Unemployed workers from Western Europe spend 33 minutes on effort - 19 for work and 14 for job search - and 313 minutes for leisure and socialising, see Table 3 from Krueger and Mueller (2008). Thus, workers divide their time in approximately 1:9 into effort and leisure.

[41] Again we compare market work and leisure for women and men, respectively.

[42] Van der Wiel (2008) estimated that the reduction of the period of notice of 3.4 months by one month leads to a wage reduction of 3%. This suggests an elasticity of 0.1

[43] Furthermore, our calibrated model implies a wage elasticity to producitvity of 0.43 which matches approximately Hagedorn and Manovskii (2008)'s estimate for the cyclicality of wages of 0.45, though for the US.

[44] Shimer (2005) shows that while for the U.S. unemployment is 10 times more volatile than productivity, the search and matching model can only generate a value of 0.5.

[45] For simplicity, we took the unweighted average across six family types and over the initial period of unemployment and long-term unemployment for 2005, see OECD (2008). Madsen (2007) and Andersen and Svarer (2007) illustrate that unemployment benefits amount to 90 % of previous earnings but face an absolute ceiling implying that gross compensation rates decline rapidly with previous income once the limit is reached.

[46] This value might well be to high: Emerson (1988), Bertola (1990) and Garibaldi (1998) rank Denmark in terms of employment protection far above Germany near the UK. Bentolila and Bertola (1990) suggest a firing cost value for the UK which is one third of the value for Germany. Various indices on employment protection provide ranges for the relative values of firing costs of Denmark from 0% to 80% of the German value: the World Bank (2008) 0.3 (difficulty of firing) or 0 (firing costs); Belot et al. (2007) 0.6 (for regular jobs) and 0.3 (for overall protection); OECD (2004) 0.6 or 0.7 for overall strictness (version 1 or 2); Botero et al. (2004) 0.8 (employment laws index); Garibaldi (1998) 0.4 (strictness of procedural constraints).

applied in Denmark, thus, we choose a cost per activated worker κ_1 equal to 2.5% in line with Andersen and Svarer (2008).[47]

The only parameter where to the best of our knowledge the literature does not supply any estimates is χ which determines the wage effect of workfare. We will set this parameter to replicate the unemployment rate of Denmark to evaluate the strength of this channel, but we will provide a robustness analysis. Tables 1, 2 and 3 summarize the calibrated parameters, the values of the variables in the calibrated steady state and the flexicurity policy parameters.

Parameter	Description	Value
δ	discount factor	0.99237
ϵ^N	work effort	0.65
h	hiring cost in terms of productivity	0.6
p	quarterly productivity	1
r	quarterly interest rate	0.0074
s	scale parameter of the operating costs distribution	1.68
θ	parameter determining the wage effect of firing costs	0.03
ζ	job finding rate parameter	0.36
x	utility parameter	1.84
β_0	net replacement rate	0.62
ρ_0	firing cost parameter relative to the wage	2.4
τ_0	tax rate	0.06

Table 1: Parameter values.

Variable	Description	Value
ϕ_0	firing rate	3.4%
μu_0	job finding rate	32%
u_0	unemaployment rate	9.5%
e_0^U	search effort	0.15

Table 2: Steady state labour market values.

Parameter	Description	Value
β_1	flexicurity net replacement rate	0.69
ϵ_1^A	work effort in workfare	0.65
κ_1	cost per activated worker	0.025
λ_1	probability of activation	0.25
ρ_1	flexicurity firing cost parameter relative to the wage	1.2
χ_1	wage effect of workfare parameter	0.4

Table 3: Flexicurity policy parameters.

4.3 Results and Intuition

As pointed out above we apply policy variables which match the Danish flexicurity approach in line with Andersen and Svarer (2008). Assuming a probability for a firm of finding an activated

[47] They argue that this corresponds to a cost of workfare in Denmark of around 3% of GDP. They point out that if the activation results in output, it could be interpreted as the net cost per activated worker.

unemployed worker of $\chi_1 = 40\%$ the flexicurity approach of adopting Denmarks' level of unemployment benefit, employment protection and introducing workfare reduces unemployment by 50%, yielding an unemployment rate of 4.8% which is equal to Denmark's 2007 unemployment rate, OECD (2007), and reduces inequality, in terms of the Gini coefficient[48] from 3.4% to 1.6%; see Table 4. In the following we will discuss the single effects and complementarities leading to these results.

Flexicurity Instrument	**% Change of Unemployment**	**Gini Coeff.**
Workfare Introduction (α_1, ϵ_1^A)	-85%	0.5%
Firing Cost Reduction (ρ_1)	-16%	2.8%
Unemployment Benefit Increase (β_1)	65%	5.4%
Joint effect	-50%	1.6%

Table 4: Single and joint effects of the flexicurity instruments on unemployment and inequality.

4.3.1 Single Effects

Reducing Firing Costs

Figure 4.2 displays the effects of reducing the firing costs parameter ρ_1.[49] Reducing firing costs reduces the *insider retention incentive* and increases the *outsider hiring incentive* and thereby, increases the firing rate as well as the hiring rate. The resulting direct effect on unemployment is ambiguous, which is commonly pointed out in the literature, e.g. Nickell (1997) and Bentolila and Bertola (1990). At the same time lower firing costs though lower the wage and consequently increase both retention and hiring incentives. This indirect wage effect of reducing firing costs counterbalances the positive direct effect on the firing rate and strengthens the positive direct effect on the hiring and thereby on the job finding rate. In our empirical exercise the indirect effect on the firing rate outweighs the respective direct effect, thereby the firing rate falls, and this in sum leads to a reduction of the unemployment rate.[50]

Furthermore, our empircial exercise indicates that a reduction of firing costs induces households to search more for jobs. The reason is that lower wages lead to a reduction of the *reward for searching for a job*, thereby, providing less incentives to search.[51] This wage effect outweighs the direct positive effect resulting from strategic complementarities, namely households search more when facing a higher hiring rate and a lower firing rate.

The Gini coefficient is lower with lower firing costs since inequality is reduced directly through a lower wage and indirectly through lower unemployment.

Increasing Unemployment Benefits

Raising unemployment benefits to the Danish level of a replacement rate of $\beta_1 = 0.69$ leads to an increase of unemployment by 65% (see Figure 4.3) and increases inequality to a Gini coefficient of 5.4%.[52]

[48] Note that the Gini coefficient generated here is lower than in reality, as our model does not generate income differentials, does not distinguish ability groups and does not take non-wage related inequalities into account.

[49] Recall that $f_1 = \rho_1 w_0$. We reduce ρ for a given calibrated wage of the prepolicy steady state, which is equivalent to reducing f.

[50] The stronger effect of lower firing costs on firings relative to hirings is in line with empirical results by Messina and Valanti (2007) showing that firing costs have stronger effects on job destruction relative to creation.

[51] This effect is counterbalanced by a lower tax on wages resulting from lower unemployment.

[52] Recall that $b_1 = \beta_1 w_0 (1 - \tau_0)$. We reduce the net replacement rate β for the calibrated wage w_0 and tax rate τ_0 of the prepolicy steady state.

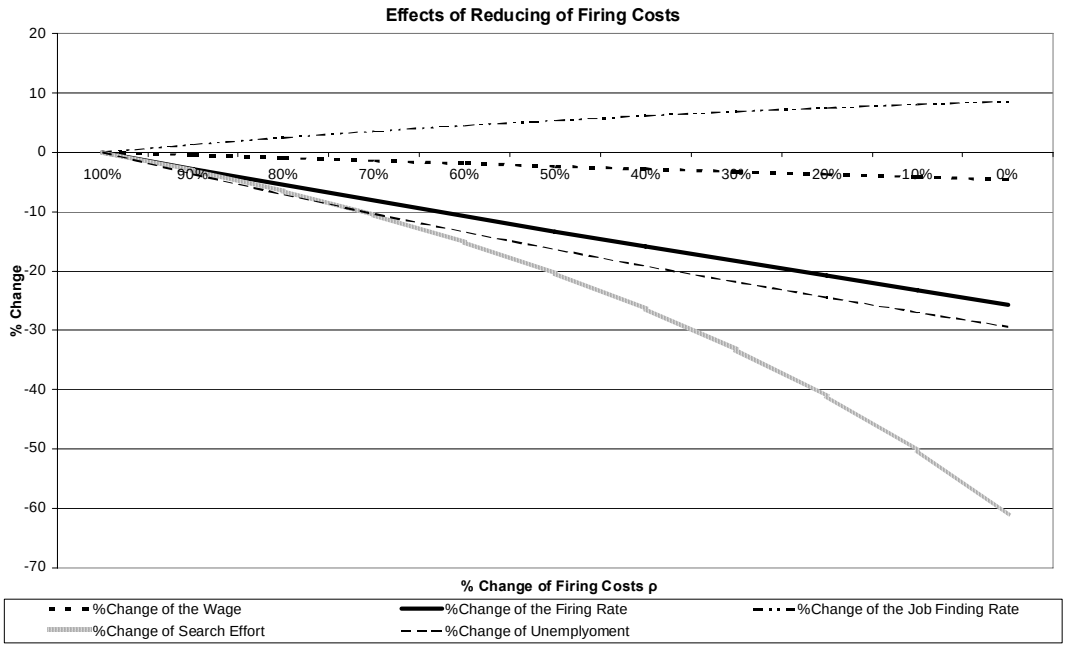

Figure 2: The effects of percentage changes of the firing costs parameter ρ on unemployment u, firing rate ϕ, the job finding rate μ, the wage w and search effort ϵ^U.

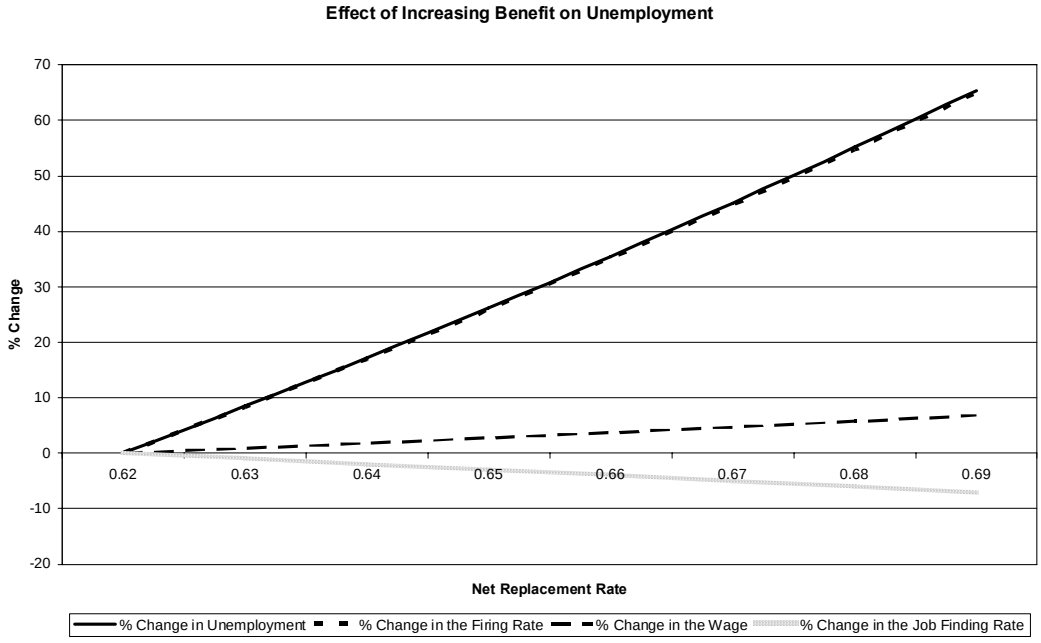

Figure 3: The effects of changes in the replacement rate β on unemployment u, firing rate ϕ, the job finding rate μ and the wage w.

The effect is straightforwardly due to the resulting higher wage, which reduces firms' *unemployed hiring incentive and insider retention incentive.* Thereby employment falls. At the same time higher unemployment benefits reduce the *reward for searching for a job.* This results since the increase in unemployment benefits and the resulting increase in taxes as well as the lower hiring and higher firing rates raise the present value of utility of an unemployed worker relative to that of an employed worker - despite the wage increase. Thus, workers search less.

Furthermore, increasing unemployment benefits to the Danish level increases inequality mainly due to higher unemployment which reduces the group receiving the higher income.

Introducing Workfare

As pointed out in the previous Section we introduce the Danish workfare requirements in line with Andersen and Svarer (2008). Assuming a probability for a firm, whose workers are on strike, of temporarily employing activated unemployed of $\chi_1 = 40\%$ the introduction of workfare reduces unemplyoment by 85% and thereby significantly reduces inequality, the Gini coefficient falls to 0.5%. For an increasing value of ϵ_1^A Figure 4.4 illustrates the three effects of workfare, which are also commonly reported in the literature.[53] The locking-in effect, namely that workers' employment probability is reduced while they are on workfare, since they have less time to search for a job, is reflected by the decreasing search effort of activated workers with increasing work effort on workfare. The so-called threat effect, which refers to the fact that unemployed workers exit unemployment more quickly before being activated, since remaining in unemployment becomes less attractive relative to employment,[54] is revealed by the increasing search effort of unemployed workers. Furthermore, also employed workers react to the introduction of workfare - they bargain a lower wage.[55]

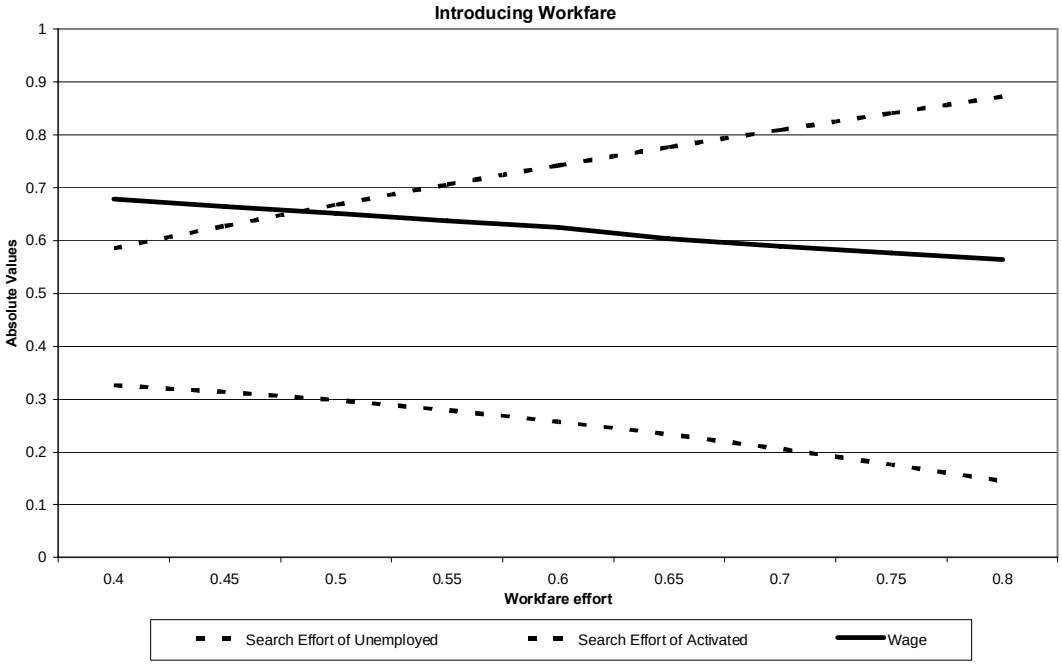

Figure 4: The effects of increasing workfare effort ϵ^A with $\lambda = 0.25$ on wage and search effort of the unemployed and the activated, reflecting wage, threat and locking-in effect, respectively.

The reason for the reduction in the negotiated wage lies in the fact that firms whose workers are on strike draw back on activated workers. Clearly, via the wage reduction, the introduction of workfare raises firms' *unemployed hiring incentive* and *insider retention incentive*. Thereby due to workfare indirectly more workers are hired and less fired and thus, employment falls.

[53] See Andersen and Svarer (2007), (2008). The following results are in line with Andersen and Svarer (2008).

[54] See Svarer (2007) and Rosholm and Svarer (2008) for empirical analyses of the threat effect.

[55] We assume that the active labour market policy (ALMP) is represented by workfare and this instrument does not have any effect on workers's productivity. Thus, our model does not take the post-programme effect into account. This effect refers to the better employment probability after having taken part in the ALMP. By omitting this positive effect, we bias our analysis against ALMP. The model adopted here could easily be extended to incorporate other instruments.

Since to the best of our knowledge the empirical literature does not supply any estimates for χ (wage effect of workfare), in Table 5 we provide the unemployment and inequality results for alternative values of this parameter. The weaker the wage effect the weaker is the unemployment reducing effect of this policy as well as of the full set of flexicurity policies. Since according to Andersen and Svarer (2007) the wage effect is one of the the dominant channels of workfare, the value adopted for χ seems reasonable.

	Effect of			
	Workfare		Flexicurity	
χ- Value	on Unemployment	on Inequality	on Unemployment	on Inequality
0.1	−26%	2.5	16	3.8
0.2	−50%	1.7	−13%	3.1
0.3	−70%	1	−29%	2.3
0.4	−85%	0.5	−50%	1.6
0.5	−94%	.2	−68%	1.0
0.6	−98%	0.1	−82%	0.6

Table 5: The unemployment and inequality effects of workfare and the full set of flexicurity policies for various values of the wage effect of workfare.

The direct effect of workfare on the household side is the relative increase of the reward for seeking a job for all unemployed, especially for the activated as illustrated in Figure 4.5.

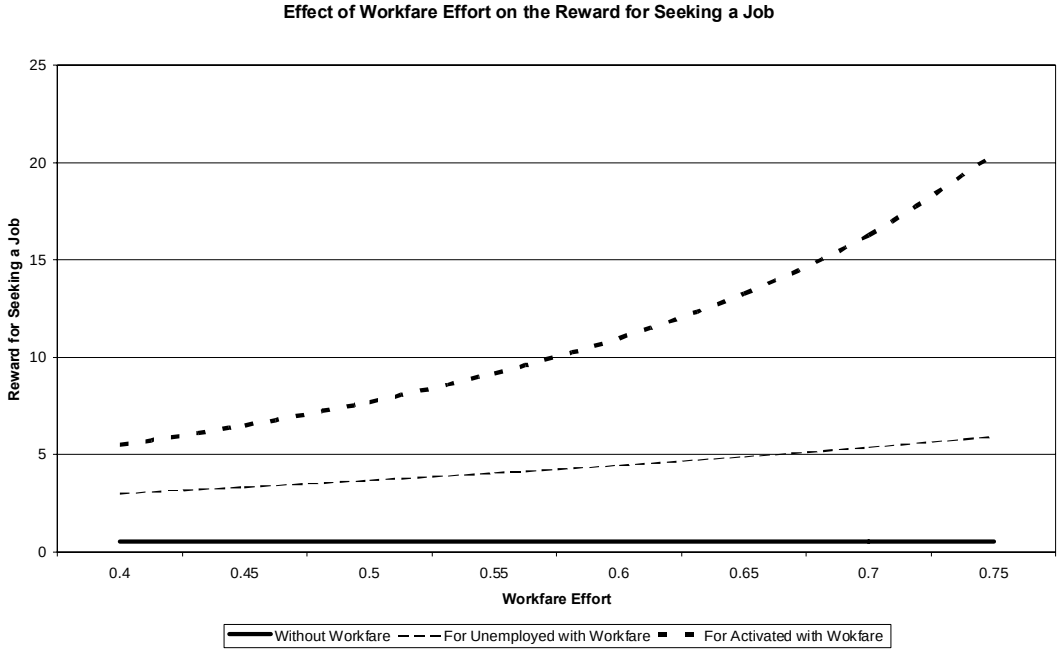

Figure 5: The effect of increasing workfare effort on the reward for seeking a job for passive and activated unemployed workers in comparison to the reward in absense of workfare.

The higher reward amplified by a higher hiring rate as in eqs. 13, 14 leads to a reduction of leisure time. This increased effort though only translates into higher search effort for the not yet activated unemployed workers (threat effect), since the activated workers need to incur work effort on workfare, in line with our specification of the utility function and calibration, they

have less time to search for a job (locking-in effect). This locking-in effect manifests itself via eq. 6, whereby the relatively less hard a worker searches for a job the respectively lower will be his job finding rate. Thereby, while the hiring rate increases, only unemployed, non-activated workers' job finding rate rises, the job finding rate for activated workers falls, in despite of a much higher reward for seeking a job because they search less than the not activated workers.

Despite of the cost of workfare, the tax rate falls since employment increase and unemployment decreases.

4.3.2 Joint Effects and Complementarities

As can be seen from Table 4, the flexicurity group of labour market policies we are considering here are complementary for Germany in the sense that the unemployment effect of each policy is greater when implemented in conjunction with the other policies than in isolation (Coe and Snower, 1997), or in other words the effectiveness of one policy depends on the implementation of other policies (Orszag and Snower, 1998).[56] As pointed out be Coe and Snower, who analyzed policy complementarities in a static world, a wide range of labour market institutions have complementary effects on unemployment and thus, labour market policies targeted at reforming these institutions are also complementary.

The three flexicurity instruments have some apparent complementarities. Implementing the three instruments jointly leads to a percentage reduction of unemployment which is 39% (size of the complementarity in %) higher than summing up the respective single effects.[57]

Policy	**Sum of Single Effects**	**Joint Effect**	**Complementarity**
Flexicurity	–36%	–50%	39%
Workfare (α_1,ϵ_1^A) and Higher Benefits (β_1)	–20%	–36%	83%
Lower Firing Costs (ρ_1) and Higher Benefits (β_1)	49%	38%	22%
Workfare (α_1,ϵ_1^A) and Lower Firing Costs (ρ_1)	–100%	–90%	–10%

Table 6: Unemployment effects of various combinations of the flexicurity instruments.

Table 6 illustrates the unemployment effects of the flexicurity policies as well as pairwise combinations of the three policies. The strongest economic complementarities in reducing unemployment are generated by the joint implementation of higher unemployment benefits and the introduction of workfare. Flexible firing rules and workfare are not complementary at all, while flexible firing rules and higher unemployment benefits are. In the following we will discuss these complementarities generated by the policies.

Increasing Unemployment Benefits and Reducing Firing Costs

As pointed out above higher unemployment benefits increase the unemployment rate, but implementing them with lower firing costs jointly increases the unemployment rate by less than when implementing them separately. Thus, for the above calibrated model for Germany these two policies are complementary in terms of reducing unemployment. This implies that a

[56] Formally presented by Coe and Snower (1997) as follows: a set of policy instruments $x_i, i = 1, ..., n$, has complementary effects on a policy objective y when $\frac{\partial^2 y}{\partial x_i \partial x_j} > 0$ for $i \neq j$.

[57] We measure the size of the complementarity in percentage terms as Oskamp and Snower (2008), as the relative difference between the joint effect and the sum of the single effects of the set of policies under consideration. In other words the percentage reduction in the total unemployment rate is 14 percentage points higher.

reduction of firing costs has a bigger employment effect if unemployment benefits are high. The reasons is the following: high firing costs and high unemployment benefits give leverage to each other. Higher unemployment benefits reduce firms' hiring and retention incentives and thereby, leverage the effect of firing costs in reducing these incentives. This interaction also holds vice versa, while firing costs reduce firms' hiring incentives, they thereby magnify the weakening of the reward for seeking a job. Thereby, the postive impact on unemployment of increasing the replacement rate when firing costs are high - due to the high leverage effect - can not be compensated by the negative impact of reducing firing costs when replacement rates are low. The joint implementation of low firing costs and a high replacement rate avoids this leverage effect.[58]

Increasing Unemployment Benefits and Introducing Workfare

The strongest complementarity is reached when higher unemployment benefits and workfare requirements are implemented jointly.

The joint introduction of these two policies couldn be justified by the concept of political complementarities, see Orszag and Snower (1998), which arise when the ability to gain voters' approval for a policy depends on the implementation of another policy. Similarily, Andersen and Svarer (2007) illustrate that the strong egalitarian foundations of the Danish welfare system ruled out general reductions in unemployment benefits to strengthen incentives.

On the economic side one could expect a reduction of unemployment benefits and workfare instruments to be equivalent from an utility perspective and thereby, make a distinction unnecessary. But as pointed out be Andersen and Svarer (2008), the labour market effects of these two policies are distinct and will differ across the three groups of workers, namley employed, unemployed and activated. This is so for several reasons. First, employed workers' contemporaneous (consumption) utility is affected by both policies - in both cases indirectly via the wage. But while a reduction in benefits has the same effect on unemployed and activated workers, this is not the case for workfare policies. The reason is that workfare has no direct effect on the instantaneous utility of the unemployed, but on the activated workers'. Furthermore, benefit changes and workfare requirements affect search incentives differently. The reason is that workfare requirements affect the marginal cost of search directly, whereas benefits have an effect via an income effect.

The strong complementarity is based on these effects of the two instruments. Analogous to the above joint implementation of reduced firing costs and increased unemployment benefits, an introduction of workfare requirements has much stronger effects when the disincentive effects due to unemployment benefits are high. While the disincentive effects are the same, workfare has much stronger effects on unemployment than the flexible firing rules, thereby also the complementarity is stronger.

Reducing Firing Costs and Introducing Workfare

While being powerfull tools to reduce unemployment, clearly, flexible firing rules and workfare requirements are weak substitutes in this respect, since the reduction of unemployment is reduced by 10% if both instruments are implemented jointly compared to summing up the single effects. As pointed out above, these policies have stronger effects when the disincentive for workers and firms to match are high. Since workfare has strong effects on unemployment

[58] Alternatively, one can argument via the tax-benefit multiplicator: since all workers behave the same and reduce their search effort due to a rise in unemployment benefits, their behaviour does not affect their job finding probability and the only channel through which the unemployment benefits changes unemployment is via the wage. A benefit increase implies a higher tax rate, which raises the wage even more and leads to higher unemployment, which in turn necessitates a higher tax rate and so on. A reduction of the firing costs weakens this tax-benefit multiplicator, via its employment enhancing effect it reduces the tax rate.

and increases firms' and workers' incentive effects, a reduction of firing cost does not contribute to the reduction of unemployment as it would do in the absence of workfare.

Flexicurity

As illustrated above the unemployment effect of the joint implementation of the three flexicurtiy instruments for Germany implies a complementarity of these instruments of 39%. To understand how this complementarity of all three instruments can be rationalized it is useful to compare their unemployment effect with the sums of the effects of the pairwise joint implementation and the respective single third instrument, as presented in Table 7:

Policy	**Joint Effect**
Flexicurity (α_1, ϵ_1^A, β_1 and ρ_1)	-50%
Sum of Pairwise and Single Effects	
Workfare and Higher Benefits (α_1, ϵ_1^A and β_1) + Lower Firing Costs (ρ_1)	-52%
Lower Firing Costs and Higher Benefits (ρ_1 and β_1) + Workfare (α_1, ϵ_1^A)	-47%
Workfare and Lower Firing Costs (α_1, ϵ_1^A and ρ_1) + Higher Benefits (β_1)	-25%

Table 7: Unemployment effects of various joint implementations of flexicurity instruments.

These results underline our previous argumentation. First, the sum of the effects of the pairwise implementation of workfare and high unemployment benefits (α_1, ϵ_1^A and β_1) and the single effects of a reduction of firing costs (ρ_1) is greater than the effect of flexicurity, since the former includes the high complementarity between workfare and high unemployment benefits but not the substitutability between workfare and the firing cost reduction. Second, flexicurity has a stronger effect on unemployment than the sum of the combination of low firing costs and high benefits, which implies only a weak complementarity, together with workfare. Third, the combination of the pairwise introduction of workfare and lower firing costs (α_1, ϵ_1^A and ρ_1) and the single implementation of higher unemployment benefits has a much smaller unemployment mitigation effect since it only takes into account the substitutability between the former two instruments

Finally, our analysis replicates the Danish experience,[59] whereby the workfare component is the decisive element in generating the economic effectiveness of the flexicurity policy.

5 Concluding Remarks

This paper analyzes the channels and complementarities of the Danish flexicurity concept in reducing unemployment and inequality. We perform the experiment of implementing Danish flexicurity in Germany using a calibrated, microfounded model, which is derived from the agents' labour market incentives.

This policy experiment replicates the Danish miracle in Germany and illustrates the strong complementarities of nearly 40% underlying the Danish flexicurity concept when implemented in Germany. Furthermore, our results emphasize the strong role of workfare policies in setting employment incentives right.

Our results underline the need for fundamental labour market reforms with a set of broad and deep policies which imply strong economic complementarities and at the same time encompass political complementarities by taking distributional objectives into account thereby facilitating the consent for implementing the reforms.

[59] See Andersen and Svarer (2007) and (2008).

The flexicurity policy enables firms to adapt to the global market, supports workers and at the same time enhances their adaptability, which is strongly required in the new wave of globalisation.[60] Thereby, this reform policy with a focus on employment security is a viable and option for Germany which tends to emphasize income and job security.

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