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Flexicurity, Taxes and Job Reallocation

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CESIFO WORKING PAPER NO. 5302
CATEGORY 1: PUBLIC FINANCE
APRIL 2015

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ISSN 2364-1428

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Abstract

This paper considers the role of flexicurity when jobs must be reallocated from a declining, traditional sector to a skill intensive expanding sector. Workers initially decide whether to acquire qualifications for skill-intensive tasks or to accept a less demanding traditional job. Unemployment arises from job separation in the declining sector and difficulties in retraining for new employment in the expanding sector. The paper derives an optimal welfare policy which combines the design of the tax schedule with three pillars of ‘flexicurity’. The optimal policy includes (i) a progressive wage tax schedule; (ii) a wage subsidy to re-employed workers; (iii) unemployment insurance; (iv) moderate job protection; and (v) active labor market policy to facilitate job reallocation.

JEL-Code: H220, J640, J650.

Keywords: flexicurity, insurance, job protection, active labor market policy.

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March 31, 2015

An earlier version of the paper was presented at Universities of St. Gallen, Dortmund, Konstanz and Munich and at the CESifo area conference on Employment and Social Protection, the L.A. Gerard-Varet conference in Marseille and the annual conference of the International Institute of Public Finance. We are grateful to seminar and conference participants for very helpful comments.

1 Introduction

It is often argued that globalization and technological progress necessitate structural change and lead to more volatile employment, shorter job tenure and an increasing need for retraining of previously acquired skills (e.g. Brown, Merkl and Snower, 2009a, and Ljungqvist and Sargent, 1998). Part of unemployment thus results from frictions in labor reallocation across jobs with different skill requirements. Given the need to facilitate and speed up reallocation towards alternative employment, a successful policy might follow the flexicurity model consisting of three pillars: *insurance* of the unemployed, *active labor market policy* (ALMP) to speed up transition into new jobs, and firing *flexibility* to close down unproductive jobs and replace them with new ones. Denmark's success in reducing its unemployment rate from about 10% to 5% over the 1990's is often attributed in good part to the flexicurity model. The purpose of flexicurity, however, is not only in reducing unemployment but also in raising productivity and aggregate income by facilitating a better allocation of labor across sectors and firms.

Unemployment insurance (UI) is a central pillar of any welfare state model and addresses a market failure due to missing private insurance markets. Gruber (1997) estimated that the consumption loss during unemployment would be three times larger without UI (a 22.2% drop instead of 6.8%). Chetty (2008) finds the current level of UI (replacement rate near 50%) to be close to optimal in the US. There is consensus on the negative sign of the effect of UI on employment, but less so on its magnitude (see Holmlund, 1998). Using the survey of Krueger and Meyer (2002), a fair summary of the effect of UI is an elasticity of unemployment duration with respect to benefits of 0.5.

Active labor market policy (ALMP) can usefully complement UI by supporting job search and retraining of unemployed workers for new jobs with alternative skill requirements. Early studies find inconclusive or insignificant effects of ALMP training programs in the short-run (see the survey by Heckman, Lalonde and Smith, 1999), mostly due to a lock-in effect. Recent studies have data to focus on medium- and long-term effects. Card, Kluge and Weber (2010) conclude from their meta-analysis that job search assistance

programs yield relatively favorable impacts, and training programs are associated with positive medium-term outcomes. For instance, Lechner, Miquel and Wunsch (2011) find that the re-employment probability rises by 20 to 40% and earnings are higher by 0 to 550 Euro, depending on the training type.

The flexicurity model specifically advises low levels of employment protection (EP). High EP is often blamed for high European unemployment rates. The most immediate effect is to reduce job separation which works towards lower unemployment. However, the additional cost makes firms reluctant to hire in the first place which works in the other direction. Indeed, empirical research since Lazear (1990) consistently finds that EP reduces flows into unemployment, but fails to report a reliable effect of EP on employment levels and aggregate unemployment. For instance, eight out of the eleven empirical studies summarized by Boeri and Jimeno (2005) report no statistically significant effect and three studies find that EP either reduces employment or increases unemployment or both. These findings confirm the offsetting effects of EP which doesn't imply, however, that it is harmless. Quite to the contrary, and independent of its effect on unemployment, the above cited findings suggest that EP locks workers into existing jobs and thereby slows down reallocation of employment to other firms and sectors with better prospects.

Aggregate productivity growth is importantly driven by ongoing reallocation of labor and capital to better uses. Lentz and Mortensen (2008) show that more productive firms grow faster and crowd out less productive ones which contributes about 53% of productivity growth. Based on their estimates, Bartelsman, Haltiwanger and Scarpetta (2013) calculate that the industry index of labor productivity is 50% higher than it would be if employment were randomly allocated within an industry. Given these findings, it might be useful to analyze the merits of flexicurity policy in a model of job reallocation between downsizing and expanding industries.

The allocation of labor to alternative jobs with different productivities and risks importantly reflects occupational choice of workers. Powell and Shan (2012) argue that high tax rates make more demanding high wage occupations less attractive and induce workers

to choose low wage jobs with more amenities. Their estimates imply that a 10% increase in the net-of-tax rate causes workers to switch to occupations paying 0.3% higher wages. Gentry and Hubbard (2004) find that steeper tax progression makes workers less likely to change to better jobs. More progressive taxes reduce the return to job search and discourage upward job mobility. In studying job reallocation, unemployment and aggregate productivity, an analysis of flexicurity should thus consider the interaction with the tax system. Finally, Boeri, Conde-Ruiz and Galasso (2012) characterize flexicurity as a scheme for redistribution not only between insiders and outsiders but also across high- and low-skilled groups and study the political forces in support of the flexicurity model. Flexicurity configurations more likely emerge in countries with a larger share of skilled groups. Progressiveness in the tax schedule and UI benefit scheme also favors flexicurity.

Most of previous theoretical research investigated different parts of flexicurity in isolation or in pairs. For instance, some papers consider EP and UI together (such as Pissarides, 2001; Blanchard and Tirole, 2008; Cahuc and Zylberberg, 2008), but do not include ALMP. In this vein, Blanchard and Tirole (2008) show that it may be preferable to finance UI with firing taxes rather than wage taxes or contributions. However, they neither include job creation nor reallocation nor ALMP. Most theoretical literature on ALMP also considers UI (reviewed in Fredriksson and Holmlund, 2006). Even though some of these ALMP and UI papers have other policy instruments (e.g. welfare in Pavoni and Violante, 2007), none explicitly includes EP. Theoretical studies of EP have reached contradictory conclusions. Early studies with EP alone find opposing effects in simulation exercises. Bertola (1990) as well as Blanchard and Portugal (2001) show that higher EP can boost employment, under certain circumstances. Hopenhayn and Rogerson (1993) find the opposite. Andersen and Svarer (2007) argue that low EP alone does not explain the decline of unemployment in Denmark. Low EP and generous UI were already in place well before the rise in unemployment. Unemployment started to come down only when Denmark implemented activation measures.

Four recent papers focus on flexicurity but do not explore all possibilities afforded by

the three pillars jointly with tax design. Andersen and Svarer (2014) allow for hiring and firing, consider UI and ALMP but assume that policy makers commit to no EP. With a simulation, they show that workfare (ALMP) may be one way to improve labor market performance without reducing UI benefits. Brown, Merkl and Snower (2009b) limit EP to firing costs instead of a firing tax which could be used to finance UI as in Blanchard and Tirole (2008). Their simulation shows that unemployment could be cut by 50% if Germany adopted the same UI, ALMP and EP policies as Denmark. Results are sensitive to some parameters with weak links to empirical evidence. Algan and Cahuc (2009) do not analyze ALMP. They show that only countries with high levels of civic attitude would benefit from flexicurity, as in Denmark. In a complementary paper, Davoine (2015) analytically characterizes policy complementarities among UI, EP and ALMP and shows how behavioral assumptions can shift optimal policy towards more or less flexicurity.¹

The present paper makes three novel contributions. First, we jointly rationalize all three pillars of flexicurity as a welfare optimal policy. Second, we analyze flexicurity together with the design of progressive labor taxes. We can thus capture the full potential of a flexicurity policy by exploiting the complementary role of all three instruments and their interaction with progressive taxes, including wage subsidies to incentivize reemployment. Third, we cast our analysis in a framework that distinguishes between sectors with differing unemployment incidence which makes the aggregate unemployment rate a function of the economy's sectoral composition. We specifically consider a less productive, declining industry where firms must shed jobs as a result of bad earnings shocks, and an expanding sector which is highly productive and more skill intensive, pays higher wages and offers more job security. Unemployment arises from job separation in the declining industry and is thus concentrated among the low skilled. Workers initially decide whether to acquire qualifications for more demanding skill-intensive tasks or to accept a less demanding traditional occupation subject to potential job destruction. We can thus study the role of flexicurity in facilitating structural change and reallocation of labor from less

¹The present paper is a much revised version of Davoine and Keuschnigg (2010). Davoine's analysis abstracts from the role of labor taxes but otherwise uses the same framework.

to more productive jobs, thereby enhancing the economy’s competitiveness and growth.²

We find that optimal welfare and tax policy is characterized by (i) a progressive wage tax schedule; (ii) a wage subsidy to re-employed workers; (iii) generous UI benefits; (iv) moderate EP to contain excessive firing; and (v) ALMP to facilitate labor reallocation. The analysis emphasizes how this optimal flexicurity and tax policy enhances structural change by facilitating job reallocation from the declining to the expanding sector. Numerical illustrations show that going from a simple flat rate UI scheme to an optimal policy can substantially boost GDP and welfare and yet contain frictional unemployment. When the expanding sector gets more productive and the wage gap gets larger, the return to job reallocation rises and welfare policy optimally shifts ‘towards more flexicurity’.

The next section sets up the model, Section 3 derives optimal policies, Section 4 considers piecemeal reform and Section 5 reports quantitative results. Section 6 concludes.

2 The Model

2.1 Sectoral Production

A mass 1 of risk-averse workers are employed in two sectors producing the same numeraire good. Sector 1 firms use a traditional technology with low skill intensity, are less productive on average and are hit by earnings shocks leading to downsizing. The declining industry must shed jobs. Workers are subject to unemployment risk. Sector 2 firms use a skill intensive technology, are more productive and not subject to earnings risk. Sector 2 firms thus offer better jobs with higher wages and safe employment prospects as the industry grows. A part N of workers invests in sector specific skills for employment in the expanding industry. The remaining part $1 - N$ does not invest and accepts a lower

²The European Commission is concerned about competitiveness, rising gaps between skilled and unskilled workers and the sustainability of social protection in a rapidly changing world. It recommends the flexicurity model as part of the Lisbon Strategy for Growth and Jobs, see EC (2007).

paying, risky job in the declining sector. Initially, the sectoral allocation of labor results from occupational choice with a discrete skill investment. After a productivity shock, a share of workers in the declining industry is fired because jobs turn out unproductive due to negative earnings shocks. Fired workers can retrain and search for a sector 2 job. All this is anticipated when investing in one's sector specific skills.

Figure 1 illustrates how retraining leads to reallocation of labor. When the outcome of the earnings shock is unfavorable, employment in sector 1 is terminated, leading to job separation with probability s and continuation with probability $1 - s$. When fired, the worker can retrain and get a sector 2 job with probability e . When retraining and job search is not successful, she remains unemployed. Upon entering sector 1, a worker may thus end up in three states. She ultimately keeps her job with probability $1 - s$, is reallocated to the expanding sector 2 with probability es , or ends up unemployed with probability $(1 - e)s$. Given independent risks, the ex ante probabilities correspond to ex post fractions. Initial and final labor allocation must satisfy the resource constraint,

$$L_1 = (1 - s)(1 - N), \quad L_2 = N + es(1 - N), \quad \delta \equiv (1 - e)s(1 - N) = 1 - L_1 - L_2. \quad (1)$$

The unemployment rate δ reflects job creation $1 - N$ and firing s in the declining industry and unsuccessful retraining $1 - e$ for new employment. Since the unemployment risk is high in sector 1 and low (zero) in the skill-intensive sector 2, unemployment is concentrated among the unskilled and necessarily reflects the sectoral composition of the economy.

Technology is Ricardian with a higher fixed productivity w_2 in the skill-intensive expanding sector while productivity in the declining industry is lower on average. Sector 2 workers thus earn a higher wage which compensates for training efforts. Workers may acquire costly skills to start a job in sector 2 right from the beginning. Alternatively, they may accept a sector 1 job without training, remain employed with probability $1 - s$ and get paid a lower wage w_1 . When the sector is downsizing and part of the workforce is laid off, workers may engage in costly retraining to obtain a better paying job in the expanding industry with probability e . If not successful, they remain unemployed and obtain low subsistence income h from home production or informal work. We thus assume

productivities to support a wage structure $w_2 > w_1 > h$.

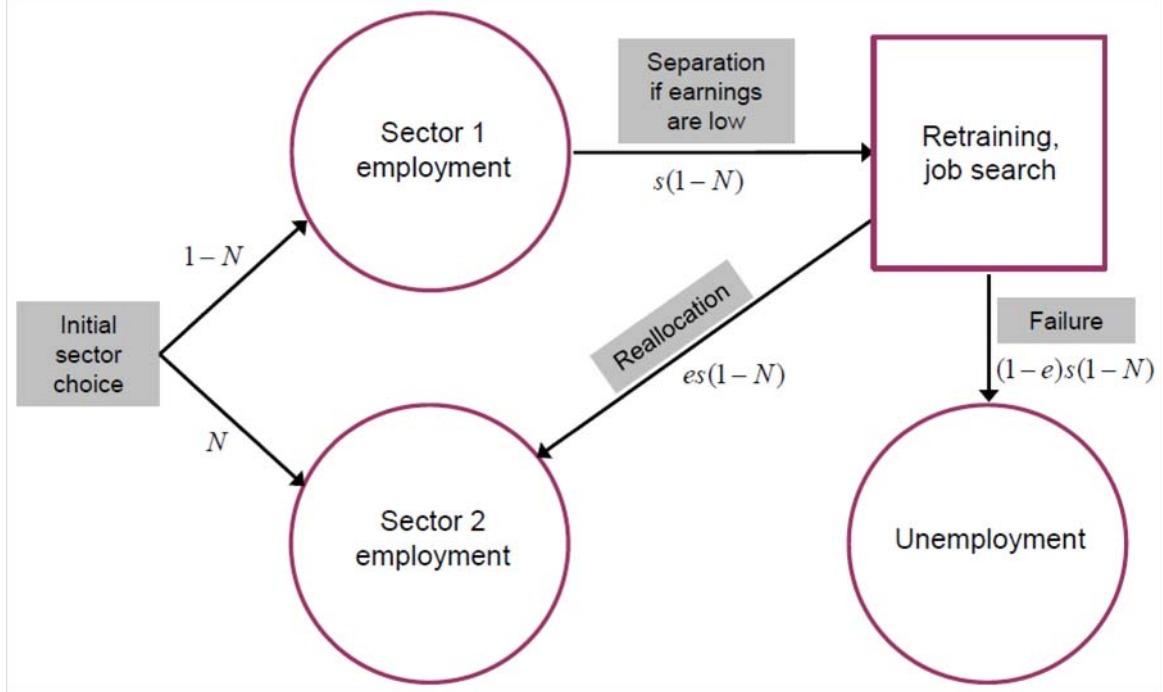


Figure 1: Job Reallocation

We consider social protection in the context of a possibly progressive wage tax schedule and allow for different proportional tax rates in each earnings class where $t_2 > t_1$. When fired sector 1 workers retrain to obtain a sector 2 wage, they may receive a wage subsidy $t_2 - t_r$ leading to a lower tax $t_r < t_2$ if the government wants to encourage reemployment.³ A priori, these tax rates are unrestricted. In addition, the government sets unemployment benefits b , may impose a firing tax t_s to reduce job separation and spend on active labor market policy (ALMP) m to support retraining and assist job search. Taking policy instruments as given, workers decide on sectoral occupational choice and retraining after job separation. Firms in the expanding industry freely hire workers at a zero profit wage w_2 .

³In this case, retraining after losing a low-skilled sector 1 job yields higher net earnings than initial education for a sector 2 job, $(1 - t_r)w_2 > (1 - t_2)w_2$. In an earlier version, we realistically assumed that retrained workers have lower productivity and are paid a lower wage $w_r < w_2$, leading to aggregate output $X_2 = w_2N + w_r es(1 - N)$ in (6) below. Our simplification doesn't affect qualitative results but still emphasizes the role of employment subsidies to facilitate labor reallocation.

Firms in the declining industry decide whether to employ a worker and, after an earnings shock materializes, whether to close down or continue the employment relationship.

Sector 1 production is organized by risk-neutral firms, each hiring one worker. With perfect competition, firm entry and job creation continue until profits are zero. After hiring, firms are subject to an earnings shock $x \in [0, \infty)$, leading to output x of the job, and must decide whether to continue with earnings $x - w_1$ or close down, fire the worker and accept a loss t_s equal to the firing tax. The firm continues if $x - w_1 \geq -t_s$. The cut-off productivity is

$$x_1 = w_1 - t_s. \quad (2)$$

When the productivity shock yields a better result $x \geq x_1$, the firm continues the employment relationship, in the other case, the job is terminated. Given a density $g(x)$ and cumulative distribution $G(x)$, the separation rate is

$$s(x_1) = \int_0^{x_1} g(x) dx, \quad 1 - s(x_1) \equiv \int_{x_1}^{\infty} g(x) dx. \quad (3)$$

A higher cut-off x_1 raises the firing rate s and reduces the continuation rate $1 - s$ where $1/s$ stands for the length of job tenure. High volatility means a high firing rate and short job duration in the declining industry, leading to high turnover.

Entry and job creation give rise to a fixed cost or start-up investment f (see Fonseca et al., 2001). Anticipating the firing decision, firms create jobs if the net present value is non-negative. Define average productivity after entry by $x^a \equiv \int_{x_1}^{\infty} x dG(x) / (1 - s)$,

$$\pi = \int_{x_1}^{\infty} (x - w_1) dG(x) - st_s - f = (1 - s)(x^a - w_1) - st_s - f \geq 0. \quad (4)$$

Job creation under perfect competition pushes up the wage until profits are zero. When firing is optimally chosen as in (2), the derivative of the profit function with respect to cut-off productivity is zero so that $d\pi/dw_1 = -(1 - s)$ and $d\pi/dt_s = -s$. The zero profit condition thus pins down the competitive wage as a function of the firing tax and other fundamental parameters. Solving $d\pi = -(1 - s)dw_1 - sdt_s = 0$ yields

$$\frac{dw_1}{dt_s} = -\frac{s}{1 - s}, \quad \frac{ds}{dt_s} = -\sigma s, \quad \sigma \equiv \frac{g(x_1)}{(1 - s)s}. \quad (5)$$

Hence, a firing tax puts a cost on firms and forces them, in zero profit equilibrium, to cut the wage. For the same reason, the tax also reduces the separation rate.

Sector 2 firms use a linear Ricardian technology, freely expand employment at a competitive wage equal to exogenous productivity w_2 , and earn zero profits. The declining sector initially creates $1 - N$ jobs. Since only $1 - s$ jobs survive and s jobs must close down due to downsizing, the number of productive jobs (or mature firms) is $L_1 = (1 - s)(1 - N)$. Given average productivity x^a , total sector 1 output X_1 net of entry costs amounts to

$$X_1 = x^a L_1 - (1 - N) f, \quad X_2 = w_2 L_2. \quad (6)$$

2.2 Labor Market Behavior

Net earnings are $y_1 = (1 - t_1) w_1$, $y_h = h + b$, $y_r = (1 - t_r) w_2$ and $y_2 = (1 - t_2) w_2$. A worker entering sector 2 enjoys utility $V_2 = u((1 - t_2) w_2)$, gross of an initial education cost. A worker entering the downsizing industry either keeps her job or is fired. When fired, she may retrain and get another job in the expanding sector with probability e , or end up unemployed with probability $1 - e$ (see Konrad, 2001, for a probabilistic model of human capital investment). Expected utility of entering sector 1 is

$$\begin{aligned} V_1 &= (1 - s) \cdot u((1 - t_1) w_1) + s \cdot u^e, \\ u^e &= \max_e e \cdot u((1 - t_r) w_2) + (1 - e) \cdot u(h(m) + b) - \zeta(e, m). \end{aligned} \quad (7)$$

Henceforth, we define $u_i \equiv u(y_i)$ for using as a short-hand. Effort costs are convex increasing, $\zeta_e > 0$ and $\zeta_{ee} > 0$. Parameter m illustrates how active labor market policy (ALMP) pushes retraining and job search. A sanctions based approach boosts retraining by reducing the worker's value of home production, $h_m < 0$. In a more positive way, ALMP may assist retraining and job search by reducing individual effort cost, $\zeta_m < 0$. When the policy is scaled up, it becomes less and less effective, $h_{mm} > 0$ and $\zeta_{mm} > 0$. Finally, the negative cross-derivative $\zeta_{em} < 0$ means that ALMP reduces marginal effort cost and stimulates job search.⁴

⁴A simple specification would be $\zeta(e, m) = \phi(m) \xi(e)$ with $\phi_m < 0 < \xi_e$, giving $\zeta_{em} = \phi_m \xi_e < 0$.

After separation, individuals spend effort on retraining and job search according to

$$u((1 - t_r) w_2) - u(h + b) = \zeta_e. \quad (8)$$

Anticipating subsequent events, workers must decide in the beginning whether to go for a less demanding job in sector 1 or undertake a sector specific skill investment for a high paying job in sector 2. Suppose agents are arranged by the innate ability $n \in [0, 1]$. The discrete effort cost $i(n)$ of acquiring sector 2 skills differs by ability according to $i'(n) > 0$, $i(0) = 0$ and $i(n) \rightarrow \infty$ for $n \rightarrow 1$. Low n indicates low effort cost and high ability. Suppose ability is uniformly distributed so that the pivotal value $N \in [0, 1]$ is also the fraction of individuals of type $n \leq N$. Given that expected utility of entering sector 1 is lower than that in sector 2, $V_1 < V_2$, highly able individuals with low cost expect $V_2 - i(n) > V_1$ and, thus, invest in a sector 2 specific qualifications. In the other case, type n opts for sector 1 and does not invest. The pivotal agent, identified by the occupational choice condition, determines the initial labor allocation across sectors,

$$V_2 - i(N) = V_1, \quad V_2 \equiv u((1 - t_2) w_2). \quad (9)$$

Initially, N workers opt for sector 2, and $1 - N$ go to sector 1. This allocation is revised by separation and retraining, leading to final employment L_1 and L_2 as in (1). Unemployment arises from frictional job reallocation from the declining to the expanding sector.

2.3 Equilibrium

Government spends $b\delta$ on unemployment benefits and $mk s(1 - N)$ on ALMP, where mk is spending per capita of fired persons in need of a new job. Fiscal budget balance requires

$$T = t_1 w_1 L_1 + t_2 w_2 N + [t_s - mk + t_r w_2 e - b(1 - e)] s(1 - N) - C = 0, \quad (10)$$

where C is an exogenous and constant level of other public spending.

Aggregate disposable income stems from earnings of employed and retrained sector 1 workers (first two terms below), benefits collected by unemployed persons, and earnings

of specialized sector 2 workers. Since h is income from non-market activity, it does not show up in disposable income,

$$Y = (1 - t_1) w_1 L_1 + [(1 - t_r) w_2 e + b(1 - e)] s(1 - N) + (1 - t_2) w_2 N. \quad (11)$$

Using (10) to replace benefits, profits $\pi = (1 - s)(x^a - w_1) - st_s - f$ to eliminate w_1 and substituting X_j yields $(Y + C + mks(1 - N) - X_1 - X_2) + \pi(1 - N) + T = 0$, where the bracket is excess demand. Total demand for market goods includes not only private and public consumption $Y + C$ but also the resource use of ALMP spending. Solving for $\pi = T = 0$ clears the product market by Walras' Law.

3 Optimal Flexicurity

In the present model, policy should address market distortions arising from firing externalities, missing private insurance markets, and frictions in retraining and job search. We first analyze how firms and households react to policy changes and then characterize the welfare optimal policy.

3.1 Behavioral Effects and Fiscal Impact

Wages and separation rates in sector 1 depend exclusively on the firing tax as in (5), but are independent of the tax benefit schedule. Taking the differential of (7-8) reveals the policy impact on expected utility u^e and job search after separation,

$$\begin{aligned} du^e &= -u'_r \cdot ew_2 dt_r + u'_h \cdot (1 - e) db + u'_m \cdot dm, \\ de &= -\varepsilon_r \cdot w_2 e dt_r - \varepsilon_b \cdot (1 - e) db + \varepsilon_m \cdot dm, \end{aligned} \quad (12)$$

where $u'_m \equiv du^e/dm = [u'_h(1 - e)h_m - \zeta_m]$ and all elasticities are defined positive,

$$\varepsilon_r \equiv \frac{u'_r}{e\zeta_{ee}} > 0, \quad \varepsilon_b \equiv \frac{u'_h}{(1 - e)\zeta_{ee}} > 0, \quad \varepsilon_m \equiv -\frac{\zeta_{em} + u'_h h_m}{\zeta_{ee}} > 0.$$

Taxes and benefits discourage job search and retraining. Expected utility rises with more generous benefits but falls with a higher labor tax burden. ALMP may be based on sanctions that reduce the value of informal activity or home production ($h_m < 0$). Alternatively, it may reduce private effort cost via assistance in job search and retraining ($\zeta_m < 0$). In both ways, ALMP spending boosts retraining and job search. The impact on welfare, however, may be positive (assistance) or negative (sanctions).

At the beginning, when seeking employment in sector 1, agents anticipate the separation risk and expect utility $V_1 = (1 - s)u_1 + su^e$. Using $\nabla \equiv (u_1 - u^e)/u'_1$,

$$\begin{aligned} dV_1 = & u'_h(1 - e)sdb - u'_r w_2 esdt_r + u'_m sdm \\ & - u'_1 w_1(1 - s)dt_1 - (1 - t_1 - \nabla\sigma)u'_1 sdt_s. \end{aligned} \quad (13)$$

After starting employment in the declining industry, individuals expect to be fired and remain unemployed with probability $(1 - e)s$. Expected utility rises by the marginal welfare gain $u'_h db$ from more generous benefits, scaled by the probability of unemployment. Other taxes and benefits are interpreted similarly. Upon job separation which is expected with probability s , ALMP benefits or hurts workers, depending on whether it is based on training and job search assistance or on sanctions. Importantly, a higher firing tax affects workers via two offsetting channels and leaves an a priori ambiguous net effect. On the one hand, the tax reduces firing by $ds = -\sigma sdt_s$ which boosts expected utility by $\nabla u'_1 = u_1 - u^e$. Less firing allows workers to enjoy more often high utility u_1 from continued sector 1 employment instead of low utility u^e as expected after separation. On the other hand, the tax reduces the gross wage by $dw_1 = -\frac{s}{1-s}dt_s$. Since this occurs with probability $1 - s$ ex ante, expected welfare declines by $(1 - s)u'_1(1 - t_1)dw_1$.

The willingness to invest in skills for a good job in the expanding industry depends on welfare $V_2 = u((1 - t_2)w_2)$ relative to expected utility V_1 . Taking the differential of the occupational choice condition in (9) yields the impact on entry into sector 2,

$$\begin{aligned} dN = & \eta_1 w_1 L_1 dt_1 + \eta_r w_2 es(1 - N)dt_r - \eta_h \delta db \\ & + \eta_s s(1 - N)dt_s - \eta_m s(1 - N)dm - \eta_2 w_2 N dt_2, \end{aligned} \quad (14)$$

where entry elasticities, are defined positive, except for $\eta_m \geq 0$,

$$\begin{aligned}\eta_1 &\equiv \frac{u'_1}{(1-N)i'}, & \eta_r &\equiv \frac{u'_r}{(1-N)i'}, & \eta_h &\equiv \frac{u'_h}{(1-N)i'}, \\ \eta_s &\equiv (1-t_1 - \nabla\sigma)\eta_1, & \eta_m &\equiv \frac{u'_m}{(1-N)i'}, & \eta_2 &\equiv \frac{u'_2}{Ni'}.\end{aligned}$$

A higher tax t_2 on sector 2 earnings discourages employment in that sector. Conversely, all policies raising the present value of net taxes on the declining industry pushes workers into the expanding sector 2. Clearly, higher unemployment benefits reduce the present value of *net* taxes and, thus, attracts labor into the declining industry. Training and job search assistance ($\eta_m > 0$) improves reemployment prospects in the event of job separation and, thus, similarly encourages sector 1 entry. Using sanctions to speed up reemployment ($\eta_m < 0$) hurts sector 1 workers and thereby favors entry into the expanding industry.

Employment effects on different margins determine the tax yield and the net result on the fiscal constraint in (10). In the present model, all labor market effects are discrete in the sense of people switching from one state to another, either via discrete skill investment dN , job separation ds or retraining with successful job search de . For each of these margins, we define effective tax rates τ^N , τ^S and τ^E , which capture the impact of behavioral changes on *net* tax revenue,

$$\begin{aligned}dT = & N \cdot w_2 dt_2 + L_1 \cdot w_1 dt_1 + es(1-N) \cdot w_2 dt_r + (1-t_1)s(1-N) dt_s \\ & -\delta \cdot db - ks(1-N) \cdot dm + \tau^N \cdot dN + \tau^S \cdot (1-N) ds + \tau^E \cdot s(1-N) de,\end{aligned}\tag{15}$$

where effective tax rates on the extensive margins of employment are defined as

$$\tau^E \equiv t_r w_2 + b, \quad \tau^S \equiv t_s + [et_r w_2 - (1-e)b] - km - t_1 w_1, \quad \tau^N \equiv t_2 w_2 - t_1 w_1 - s\tau^S.$$

Using these rates, one can write the fiscal constraint as $T = t_2 w_2 - \tau^N (1-N) - C = 0$. If one more person switches from sector 1 into sector 2 employment, net tax revenue rises by τ^N . The net impact consists of the differential tax liability of sector 2 over sector 1 employees minus the additional net tax revenue τ^S that is collected when a sector 1 worker gets fired, an event which occurs with probability s . The ‘effective’ firing tax τ^S captures

the fiscal consequences of job separation. It consists of the firing tax paid by firms, plus the average *net* tax liability of a worker after separation, equal to $et_r w_2 - (1 - e)b$, minus spending km on ALMP per capita of a fired worker, minus the foregone tax $t_1 w_1$ when this person is no longer employed in sector 1. Writing the net tax liability after separation as $et_r w_2 - (1 - e)b = e\tau^E - b$ reveals the fiscal gain τ^E of putting one more person back to work, consisting of the wage tax $t_r w_2$ of this reemployed person plus the savings in unemployment benefits when this same person no longer collects benefits.

Using these effective tax rates and substituting the behavioral changes given above yields a change in *net* fiscal revenue equal to

$$\begin{aligned}
dT &= (1 - \tau^N \eta_2) w_2 N dt_2 + (1 + \tau^N \eta_1) w_1 L_1 dt_1 \\
&+ (1 + \tau^N \eta_r - \tau^E \varepsilon_r) w_2 e s (1 - N) dt_r - (1 + \tau^N \eta_h + \tau^E \varepsilon_b) \delta db \\
&+ (1 - t_1 + \tau^N \eta_s - \tau^S \sigma) s (1 - N) dt_s - (k + \tau^N \eta_m - \tau^E \varepsilon_m) s (1 - N) dm.
\end{aligned} \tag{16}$$

For example, spending on more intensive ALMP rises by $k \cdot s (1 - N) dm$ which obviously is a loss of *net* tax revenue. If the policy mainly imposes sanctions ($\eta_m < 0$), it pushes $\eta_m s (1 - N) dm$ more workers to enter sector 2. Since each one adds τ^N in expected value to the fiscal budget, net tax revenue rises by $\tau^N \eta_m s (1 - N) dm$. The budget further improves since it pushes a larger portion of all fired persons back to work and raises the number of reemployed sector 1 workers by $\varepsilon_m s (1 - N) dm$. Each of these persons who were previously unemployed and now get a job, pays tax and stops claiming benefits, adding τ^E to the budget. Adding up all these consequences, the net fiscal cost is $(k + \tau^N \eta_m - \tau^E \varepsilon_m) s N dm$ instead of $ks N dm$. The difference reflects self-financing due to the beneficial labor market consequences of sanctions. If ALMP mainly consists of training and job search assistance, it raises welfare and attracts more workers to sector 1 ($\eta_m > 0$) which is costly to the government and thereby weakens self-financing.

3.2 Welfare Optimal Policy

Expected utility ex ante, prior to entry, equals average welfare ex post. An optimal policy maximizes social welfare $V = \max_{t_1, t_r, t_2, t_s, b, m} (1 - N) V_1 + N V_2 - \int_0^N i(n) dn + \lambda T$ where

λ is the Lagrange multiplier relating to the fiscal constraint $T = 0$. Due to occupational choice, a variation of N has no impact on welfare. Welfare maximization thus implies $dV = (1 - N) dV_1 + N dV_2 + \lambda dT = 0$. Substituting (13) and (16) yields

$$\begin{aligned}
dV/dt_1 &= - [u'_1 - (1 + \tau^N \eta_1) \lambda] w_1 L_1 = 0, \\
dV/dt_r &= - [u'_r - (1 + \tau^N \eta_r - \tau^E \varepsilon_r) \lambda] w_2 e s (1 - N) = 0, \\
dV/dt_2 &= - [u'_2 - (1 - \tau^N \eta_2) \lambda] w_2 N = 0, \\
dV/dt_s &= - [(1 - t_1 - \nabla \sigma) u'_1 - (1 - t_1 + \tau^N \eta_s - \tau^S \sigma) \lambda] s (1 - N) = 0, \\
dV/db &= [u'_h - (1 + \tau^N \eta_h + \tau^E \varepsilon_b) \lambda] \delta = 0, \\
dV/dm &= [u'_m - (k + \tau^N \eta_m - \tau^E \varepsilon_m) \lambda] s (1 - N) = 0.
\end{aligned} \tag{17}$$

Taking ratios to eliminate the shadow price λ leaves five optimality conditions plus the fiscal constraint which implicitly determine the optimal values of the six policy variables.

Unemployment Insurance: Dividing the second and fifth conditions yields optimal consumption smoothing after dismissal,

$$\frac{u'_r}{u'_h} = \frac{1 + \tau^N \eta_r - \tau^E \varepsilon_r}{1 + \tau^N \eta_h + \tau^E \varepsilon_b} < 1. \tag{18}$$

The left side reflects the marginal rate of substitution between consumption in the reemployed and unemployed states (equal to $-\frac{e}{1-e} \frac{u'_r}{u'_h}$). The right side (times $-\frac{e}{1-e}$) is proportional to the rate at which government can shift consumption from the good to the bad state. If effort were inelastic (ε -elasticities zero), optimal policy would implement full consumption smoothing between reemployment and unemployment, $u'_r = u'_h$ and, in turn, $\eta_r = \eta_h$. This is shown by the tangency point on the 45°-line in the right panel of Figure 2. However, insurance diminishes incentives for job search and retraining. Insurance becomes more costly when it contributes to higher unemployment, thereby inflating social spending and simultaneously losing wage tax revenue. The net fiscal effect is proportional to the participation tax τ^E . Optimal policy thus advises limited insurance, leaving an income gap $(1 - t_r) w_2 > b + h$ and $u'_r < u'_h$.

Insurance of Earnings Risk: Job reallocation moves workers from low paying jobs in the declining industry to better jobs in the expanding sector, $w_2 > w_1$, although reemployment is possible only if retraining and job search are successful. Apart from unemployment insurance, the purpose of progressive taxation is to insure workers against earnings risk. Dividing the second by the first condition yields

$$\frac{u'_r}{u'_1} = \frac{1 + \tau^N \eta_r - \tau^E \varepsilon_r}{1 + \tau^N \eta_1} < 1. \quad (19)$$

Without moral hazard ($\varepsilon_r = 0$), optimal policy aims at complete consumption smoothing between primary and reallocated employment, $u'_1 = u'_r$ and $\eta_r = \eta_1$, giving $(1 - t_1) w_1 = (1 - t_r) w_2$. Full insurance requires a progressive rate structure, $t_r > t_1$. If there is moral hazard, it becomes optimal to strengthen incentives for retraining by shifting relatively more income towards reemployment. This calls for reducing progressivity by lowering t_r , implying a larger wage subsidy $(t_2 - t_r) w_2$. With optimal policy, we thus have $(1 - t_1) w_1 < (1 - t_r) w_2$. The left panel of Figure 2 illustrates.⁵

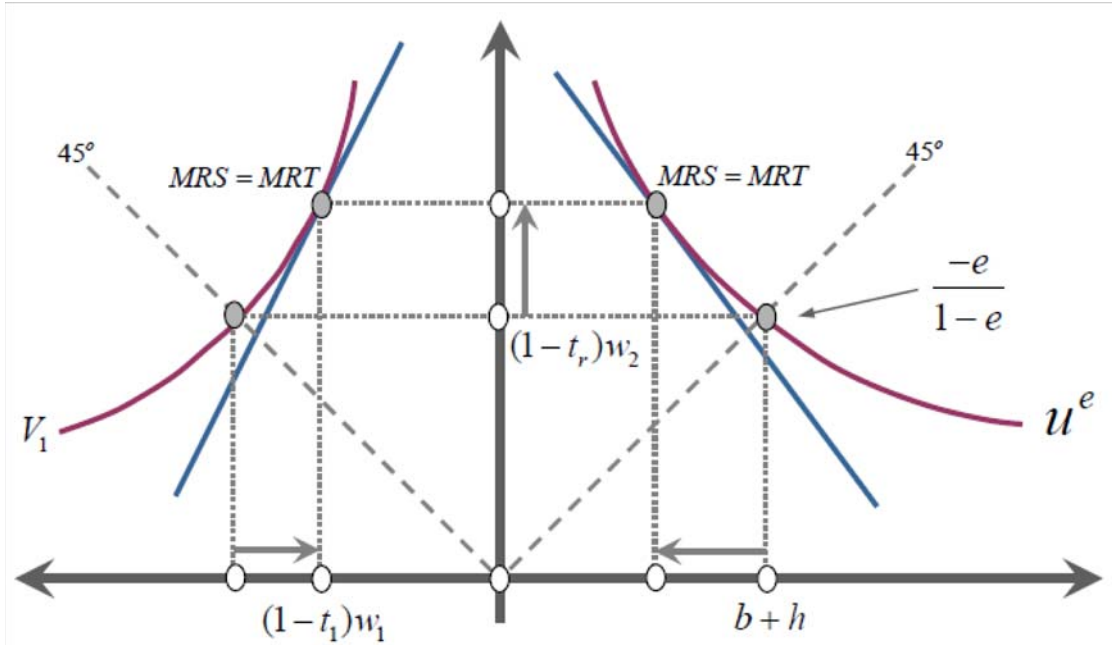


Figure 2: Insurance and Job Reallocation

⁵Job loss reduces utility so that the participation constraint is slack, $u_1 > u^e$. With full consumption smoothing, $u_1 = u_r = u_h$, the utility loss is equal to the retraining cost, $u_1 - u^e = \zeta$.

Redistribution: Policy should redistribute between skilled workers in good sector 2 jobs and those in low paying sector 1 jobs. Dividing the first and third conditions yields

$$\frac{u'_1}{u'_2} = \frac{1 + \tau^N \eta_1}{1 - \tau^N \eta_2} > 1. \quad (20)$$

Clearly, if the skill distribution were exogenous and a result of pure luck, $\eta_j = 0$, optimal policy would implement full redistribution, $u'_1 = u'_2$ and $(1 - t_1) w_1 = (1 - t_2) w_2$. Given the wage differential, $w_2 > w_1$, full redistribution calls for a steeply progressive tax schedule, $t_2 > t_1$.⁶ If skills are elastic, tax progressivity is reduced. Redistribution diminishes incentives for initial skill investments. For each additional unskilled person, net tax revenue shrinks by τ^N . The resulting deadweight loss makes redistribution costly and prevents perfect consumption smoothing, $u'_1 > u'_2$ and $(1 - t_1) w_1 < (1 - t_2) w_2$.

Job Protection: The government may use a firing tax to implement an optimal degree of job protection. Noting $\eta_s \equiv (1 - t_1 - \nabla \sigma) \eta_1$, the first and fourth conditions yield

$$\tau^S = \nabla = (u_1 - u^e) / u'_1 \quad \Rightarrow \quad t_s = t_1 w_1 + (1 - e) b - e t_r w_2 + km + \nabla. \quad (21)$$

The firing tax performs the same role as in Blanchard and Tirole (2008), even though the tax has new redistributive implications and additionally affects job creation and hiring. Its purpose is to internalize negative firing externalities. When dismissing a worker, the firm imposes an income equivalent utility loss ∇ on that person. In addition, firing creates fiscal externalities consisting of several components: there is one person less paying the tax t_1 , there is one person more who collects on average a net transfer $(1 - e) b - e t_r w_2$, and there is extra spending km per capita on ALMP. All these components might justify a substantial level of the firing tax.

Active Labor Market Policy: ALMP can usefully complement other instruments. In raising m , the government spends a larger amount km per capita of the $s(1 - N)$

⁶With full redistribution ex post, the government must cover effort cost $i(n)$ for each type. With occupational choice, education cost is compensated by an ex post utility differential of the marginal type, $V_2 - i(N) = V_1$. All more talented individuals enjoy a rent, i.e., $V_2 - i(n) > V_1$ for $n < N$.

dismissed workers who are in need to be reallocated to another job. Dividing the sixth by the first condition, noting $\eta_m \equiv \eta_1 u_m^e / u_1'$ and rearranging yields

$$\frac{u_m^e}{u_1'} = k - \tau^E \varepsilon_m. \quad (22)$$

The left side states the marginal benefit of ALMP which raises expected utility u^e of a fired relative to a retained worker. ALMP is valuable only if it boosts welfare, i.e., $u_m^e > 0$. To this end, the program must contain substantial supporting elements such as reducing private costs of retraining and job search, $\zeta_m < 0$. Although a purely sanctions based system with $h_m < 0$ might be quite effective in fighting unemployment, it also reduces welfare, $u_m^e = u_h'(1 - e)h_m < 0$. It thus cannot be part of an optimal program. The social cost of ALMP consists of the marginal resource cost k per capita and is reduced by the budget savings $\tau^E \varepsilon_m$ if the program puts a larger fraction of fired workers back to work. The elasticity ε_m measures how effective it is to support job reallocation and reemployment. The budget savings are proportional to the participation tax $\tau^E = t_r w_2 + b$. Immervoll et al. (2007) found participation tax rates in Europe to vary mostly between 50 to 70% of gross wages, and up to 80% in Nordic countries. The upshot is that the participation tax and, in turn, the fiscal savings from ALMP are large in a generous welfare state with high benefits and required taxes. These savings reduce the social cost of ALMP and lead to larger programs. Programs that emphasize active support instead of sancations can become an essential ingredient of advanced welfare states.

A Special Case: We reproduce two central results of Blanchard and Tirole (2008), henceforth BT, as a special case of the present model. Excluding entry and job creation, we fix the mass of sector 1 workers at $N = 1$. Further, BT abstract from job reallocation so that $e = 0$ and firing always results in unemployment. The ε - and η -elasticities are thus zero. Social welfare is $V_1 = (1 - s)u_1 + s(u_h - \zeta)$. The fiscal constraint reduces to $T = t_1 w_1 (1 - s) + (t_s - b)s = t_1 w_1 + s\tau^S = 0$, where $\tau^S \equiv t_s - b - t_1 w_1$ is the effective firing tax. The optimality conditions in (17) with respect to t_1 , b and t_s are reduced to

$$u_1' = \lambda = u_h', \quad \tau^S = \nabla. \quad (23)$$

The optimal policy in BT assures full consumption smoothing $(1 - t_1)w_1 = h + b$. The stigma ζ of a job loss thus leads to a utility differential between work and unemployment equal to $\nabla = (u_1 - u_h + \zeta)/u'_1 = \zeta/u'_1$. Now suppose first that stigma is absent, so that $\tau^S = \nabla = 0$. The fiscal constraint $t_1w_1 = -s\tau^S$ then implies $t_1 = 0$, and $t_s = b$. Benefits are exclusively financed with a firing tax with no other tax on wages. Full consumption smoothing implies $w_1 = h + b$. Substituting this into (2) leads to a firing threshold $x_1 = w_1 - t_s = h + b - t_s = h$, i.e. $x_1 = h$ as in Proposition 1 of BT. If there is a positive stigma, the effective firing tax $\tau^S = \nabla$ is positive, implying $t_s = b + t_1w_1 + \nabla$. The fiscal budget leads to a wage subsidy $t_1w_1 = -s\nabla < 0$. Substituting t_s into the firing rule and noting full insurance yields $x_1 = h - \nabla < h$. If there is stigma of job loss, the firing externality becomes larger. Optimal policy thus raises the firing tax to reduce job separation. Since this also depresses wages, workers are compensated by an employment subsidy $t_1w_1 < 0$. These results replicate Proposition 2 of BT.

4 Piecemeal Reform

This section considers piecemeal reform to illustrate the mechanics of the model and to show how small policy changes implementing steps towards an optimal policy lead to beneficial labor market and sectoral adjustment and thereby promise welfare gains. Suppose the government initially operates a flat rate unemployment insurance (UI) scheme financed with a proportional tax on all workers, $t_1 = t_r = t_2 = t$, and abstains from any other labor market intervention, i.e. $t_s = m = 0$. This scheme resembles most current UI schemes which have largely flat contribution rates and often contain cross-subsidization between groups with different unemployment risks. Given UI, the participation tax on dismissed workers is relatively large, $\tau^E \equiv tw_2 + b > 0$. In contrast, the effective tax on firing is negative, $\tau^S \equiv [etw_2 - (1 - e)b] - tw_1 < 0$. There is no statutory firing tax, $t_s = 0$, and UI of dismissed workers is cross-subsidized by other groups so that the square bracket is negative. If insurance were actuarially fair, the square bracket would be zero. The flat UI scheme thus ends up subsidizing firing of workers in the declining sector, i.e.

more firing leads to a loss in the fiscal budget proportional to τ^S . Finally, the policy cross-subsidizes from sector 2 to sector 1 workers and, thereby, encourages entry and job creation in sector 1. This is seen by the fiscal constraint $T = tw_2 - \tau^N(1 - N) = 0$, which implies $\tau^N > 0$ when $t > 0$. With $\tau^N = tw_2 - tw_1 - s\tau^S$ positive, each additional worker in the declining sector is a fiscal drain while an expansion of the skill-intensive sector would improve the fiscal stance.

The following scenarios ‘improve’ on this scheme in important ways to yield higher social welfare. Using (13), welfare changes by $dV = (1 - N)dV_1 + NdV_2$, or

$$dV = -u'_2w_2Ndt_2 - u'_1w_1L_1dt_1 - u'_r w_2 es(1 - N)dt_r + u'_h \delta db - (1 - t_1 - \nabla\sigma)u'_1s(1 - N)dt_s + u'_m s(1 - N)dm. \quad (24)$$

Sectoral Redistribution: Financing UI with a flat tax does not satisfy the distributional concerns in policy making. Given concave utility and the fact that earnings are lower in sector 1, a welfare based policy calls for redistribution. To move to a progressive tax structure, $t_2 > t_1$, we raise the tax rate on high wage income earned in sector 2 and cut the rate on low wage earnings in sector 1. By (16), budget balance dictates

$$w_1L_1dt_1 = -\frac{1 - \tau^N\eta_2}{1 + \tau^N\eta_1}w_2Ndt_2. \quad (25)$$

Note that this reform, by raising t_2 and not adjusting t_r , implicitly introduces a wage subsidy on retrained sector 2 workers. Evaluating (24) shows how further redistribution by means of tax progression boosts welfare,

$$dV = \left[\frac{u'_1}{u'_2} - \frac{1 + \tau^N\eta_1}{1 - \tau^N\eta_2} \right] \frac{1 - \tau^N\eta_2}{1 + \tau^N\eta_1} u'_2 w_2 N dt_2. \quad (26)$$

Since $w_2 > w_1$, the ratio u'_1/u'_2 exceeds one but the second term might also be larger than one. When starting from an untaxed equilibrium, the effective entry tax τ^N is zero and the square bracket is positive. However, the flat UI scheme already redistributes towards sector 1 so that $\tau^N > 0$. Hence, moving towards a more progressive rate structure ($dt_1 < dt_r = 0 < dt_2$) is welfare improving only if the flat UI scheme is small. A policy implication is that designing redistribution via the tax transfer schedule should

take account of the implicit redistribution that already occurs in the social insurance system. Eventually, redistribution could become excessive relative to the optimal level characterized in (20).

Since this policy reform keeps not only $t_s = m = 0$ constant but also t_r and b , it has no impact on the separation rate s and on job search and labor reallocation e . The only effect is on entry and job creation. Evaluating (14) subject to (25) yields

$$dN = - \left[\eta_2 + \eta_1 \frac{1 - \tau^N \eta_2}{1 + \tau^N \eta_1} \right] w_2 N dt_2 < 0. \quad (27)$$

The higher tax rate on sector 2 and the lower rate on sector 1 employment encourage entry into the declining industry.⁷ Since neither the firing rate nor the rate of job reallocation are affected, the policy boosts unemployment, $d\delta = -(1 - e)sdN > 0$. Structural change adds to aggregate unemployment when sectors with high unemployment rates expand and sectors with a low unemployment incidence shrink.

Subsidizing Job Reallocation: While redistribution calls for a progressive tax ($t_2 = t_r > t_1$), the government might want to encourage retraining by reducing the effective rate τ^E , i.e., by complementing the tax schedule with a special tax credit or wage subsidy $t_2 - t_r$ to a reemployed worker. Wage taxes and UI discourage retraining and job search of fired workers and reduce the transition rate e into alternative employment. The higher are unemployment benefits, the more compelling is the case for a wage subsidy. When switching from unemployment into a job, individuals face a high participation tax τ^E . Bringing it down helps to speed up job reallocation. Since high benefits are needed to provide insurance, the only way to do so is to cut the tax rate t_r . Using the budget constraint (16) gives

$$dt_r = - \frac{(1 - \tau^N \eta_2) w_2 N}{(1 + \tau^N \eta_r - \tau^E \varepsilon_r) w_2 e s (1 - N)} \cdot dt_2. \quad (28)$$

⁷In the same vein, the UI scheme also cross-subsidizes from sector 2 to sector 1 workers and, thereby, encourages entry into the declining industry.

The wage subsidy to reemployed workers boosts welfare in (24) by

$$dV = \left[\frac{1 - \tau^N \eta_2}{1 + \tau^N \eta_r - \tau^E \varepsilon_r} - \frac{u'_2}{u'_r} \right] u'_r w_2 N \cdot dt_2. \quad (29)$$

Starting from equal treatment of sector 2 workers ($t_2 = t_r$), the rate of substitution $u'_2/u'_r = 1$. Given relatively generous UI benefits, the participation tax rate $\tau^E \equiv t_r w_2 + b$ is also rather high which reduces the denominator and inflates the first term in the square bracket. Given a large firing tax t_s , the effective rate τ^S becomes relatively large and thereby leads to a small effective tax rate $\tau^N \equiv t_2 w_2 - t_1 w_1 - s \tau^S$ on sector 2 entry. In consequence, the first term in the square bracket is likely to exceed unity. Independent of this, the square bracket becomes unambiguously positive if entry is very inelastic ($\eta_r, \eta_2 \rightarrow 0$) which is very realistic in the ‘short-run’. Intuitively, the policy encourages job search and reemployment, but also redistributes from sector 2 to (reemployed) sector 1 workers, thereby discouraging entry into the expanding industry. If distortions in job search dominate, the policy boosts welfare.

Raising t_2 to finance a budget neutral tax cut for reemployed workers boosts welfare. Since the policy redistributes from sector 2 to (reemployed) sector 1 workers, it favors entry into the declining industry at the expense of sector 2, $dN = \eta_r w_2 e s (1 - N) dt_r - \eta_2 w_2 N dt_2 < 0$, see (14). Since firing is independent of t_2 and t_r , the separation rate is unchanged but the cut in the participation tax stimulates reemployment by $de = -\varepsilon_r w_2 e dt_r$ and contributes to a higher reallocation rate. Reallocation thus dampens the negative effect of entry on sector 2 output, $X_2 = w_2 \cdot N + w_2 \cdot e s (1 - N)$. Alternatively, assuming that entry is a slow process, we could distinguish a short- and long-run effect on sectoral output. Holding the initial labor allocation N fixed, the policy moderately supports reallocation. Although the outflow from sector 1 is constant, a larger share of separated workers is reemployed. In the short-run, sector 2 output thereby increases. In the long-run, entry shifts labor from the expanding to the declining industry and leads to a large reduction in sector 2 output which is partly offset by increased sector 1 production, leaving a small effect on GDP. The effect on unemployment is ambiguous as well. When more workers enter the declining industry with a high rate of job separation, the aggregate

unemployment rate rises. On the other hand, more frequent reemployment contributes to a lower rate, leaving an overall ambiguous effect. The column TAX in Table 1 below combines the two scenarios and illustrates the optimality of a progressive tax structure when other instruments are not available.

Relaxing Job Protection: Job protection usefully complements the UI scheme but it may easily be excessive and stand in the way of job reallocation. Given free entry and perfect competition, the incidence of the wage tax in sector 1 is entirely on workers while the firing tax falls on firms. When the firing tax is cut, firms compete away cost savings by offering a higher wage until they break even. To offset the windfall gain from cutting the firing tax, the scenario raises the wage tax t_1 . Fiscal balance in (16) requires

$$s(1-N)dt_s = -\frac{1+\tau^N\eta_1}{1-t_1+\tau^N\eta_s-\tau^S\sigma}w_1L_1dt_1. \quad (30)$$

Substituting into the welfare change stated in (24) and using $\eta_s = (1-t_1-\nabla\sigma)\eta_1$ yields

$$dV = -\frac{\tau^S-\nabla}{1+\tau^N\eta_1}\sigma u'_1s(1-N)dt_s. \quad (31)$$

Reducing job protection boosts turnover, $ds = -\sigma s dt_s$, so that workers are exposed more frequently to the utility loss $\nabla u'_1 = u_1 - u^e$. This utility loss is relatively small since workers may not only end up unemployed but might succeed to retrain for an even better paying sector 2 job. On the other hand, a country with substantial job protection creates a relatively large effective tax τ^S on job separation. Combining the two observations, we find that reducing job protection can boost welfare according to (31). Note that cutting the firing tax boosts welfare by pushing up wages while raising the wage tax lowers it, $dV = -u'_1w_1L_1dt_1 - (1-t_1-\nabla\sigma)u'_1s(1-N)dt_s$. Suppose entry were fixed so that the η -elasticities are zero. Budget balance thus affords a tax cut equal to $s(1-N)dt_s = -\frac{1}{1-t_1-\tau^S\sigma}w_1L_1dt_1$. If firing were fixed ($\sigma = 0$), or if the firing tax is optimal such that $\tau^S = \nabla$, the size of these tax changes is such that the two welfare effects just cancel. If the firing tax t_s is larger than optimal, $\tau^S > \nabla$, induced firing creates substantial revenue. The reduction in the firing tax can thus be larger than what

is needed to offset the negative welfare effect of a higher wage tax. Net welfare rises. Similar arguments apply when entry is endogenous.

Starting from a high level, relaxing job protection promises higher expected welfare from sector 1 employment. In consequence, some marginal types find it no longer worthwhile to invest in the required qualifications for a skill intensive sector 2 occupation. Entry shifts labor allocation from the expanding to the declining industry. Evaluating (14) and using the same steps as before results in

$$dN = \frac{\tau^S - \nabla}{1 + \tau^N \eta_1} \sigma \eta_1 s (1 - N) dt_s. \quad (32)$$

Since the reemployment rate e remains constant in this scenario, unemployment changes by $d\delta = (1 - e) [(1 - N) ds - s dN]$. Substituting the changes in entry and separation, we find that unemployment rises by

$$d\delta = -(1 - e) \left[1 + \frac{\tau^S - \nabla}{1 + \tau^N \eta_1} s \eta_1 \right] \sigma s (1 - N) dt_s. \quad (33)$$

Cutting job protection directly raises unemployment by allowing for a higher rate of job separation. The policy further adds to unemployment by favoring entry to the downsizing sector where the incidence of sectoral unemployment is high. The effect of entry on sectoral output is partly revised by a higher rate of job reallocation. A substantial share of separated workers are successfully retrained for more attractive sector 2 jobs.

Active Labor Market Policy: Finally, we analyze the consequences of complementing the flat UI scheme by introducing ALMP to facilitate retraining, search and job reallocation. We raise the wage tax of workers in the declining industry since the policy benefits them by improving their labor market prospects if they get fired. Spending more on ALMP by raising m thus requires a higher tax on sector 1 employees,

$$w_1 L_1 dt_1 = \frac{k + \tau^N \eta_m - \tau^E \varepsilon_m}{1 + \tau^N \eta_1} s (1 - N) dm. \quad (34)$$

Welfare rises if the gains from better labor market prospects after firing dominate the welfare loss from a higher tax on sector 1 employment. Using $\eta_m = u_m^e \eta_1 / u_1'$ yields a

welfare change that is related to the optimality condition in (22),

$$dV = \left[\frac{u_m^e}{u_1'} - (k - \tau^E \varepsilon_m) \right] \frac{u_1'}{1 + \tau^N \eta_1} s (1 - N) dm. \quad (35)$$

Whether ALMP is welfare improving depends on its potency to raise expected utility of fired workers, $u_m^e = u_h'(1 - e)h_m - \zeta_m$, relative to its cost, $k - \tau^E \varepsilon_m$. Clearly, a policy based on sanctions ($h_m < 0$) reduces welfare so that ALMP yields no benefit that could justify its cost, and is not advised. Even if ALMP is productive and raises welfare by reducing private costs, it might still be too costly (k high) and reduce net welfare. However, if high UI benefits are offered to insure workers, the participation tax τ^E is high and the policy yields large fiscal gains. In bringing more people back to work, it boosts tax revenue and contains social spending. The net fiscal cost of ALMP is greatly reduced in the presence of a large welfare state. This is even more the case if the policy is very effective in reallocating workers, as indicated by a large elasticity ε_m . Given that ALMP is sufficiently productive, it becomes an essential ingredient of the welfare state.

ALMP boosts job search by $de = \varepsilon_m dm$. Since t_s is fixed, the separation rate remains unchanged. If the policy raises net welfare in (35), it encourages entry into the risky sector and draws labor from sector 2. Imposing budget balance and using $\eta_m = u_m^e \eta_1 / u_1'$ yields an entry response in (14) equal to

$$dN = - \left[\frac{u_m^e}{u_1'} - (k - \tau^E \varepsilon_m) \right] \frac{\eta_1}{1 + \tau^N \eta_1} s (1 - N) dm. \quad (36)$$

ALMP speeds up job reallocation and reduces unemployment after a job loss. By encouraging entry into the declining sector, it raises the absolute levels of job separation which adds to unemployment $\delta = (1 - e) s (1 - N)$. The net effect is a priori ambiguous. However, if ALMP is at its optimal level, the square bracket is zero and the policy does not affect entry and sectoral composition at the margin. In this case, ALMP contributes to lower unemployment by stimulating job search.

5 Steps Towards Optimal Policies

This section numerically illustrates our results and shows how different steps towards an optimal flexicurity policy boost welfare. We also show how a productivity gain in sector 2 shifts the nature of optimal tax and welfare policies. We start in a non-optimal state as in column ‘Base’ of Table 1.

Wages paid in the skill-intensive sector are 30% higher than sector 1 wages which are equal to 1 in the outset. Initially, 40% of the labor force trains to get access to better paying but more demanding jobs. The rest chooses a standard job in the downsizing sector 1 where the separation rate is 25%. After separation, 60% get reemployed in the expanding sector, the rest ends up unemployed. Unemployment thus amounts to 6% ($.6 \times .25 \times .4$), reflecting job creation (entry), job destruction (firing) and the frictions in job reallocation (search). Ultimately, only 45% of the workforce remain employed in the downsizing industry and 49% end up in sector 2. Job reallocation expands sector 2 employment by about 22% relative to the initial allocation resulting from occupational choice. In the end, sector 2 accounts for 55% of gdp.

The government spends on public consumption worth 20% of GDP. Public goods per capita are fixed and, thus, do not affect welfare analysis. UI benefits amount to a net of tax replacement rate of 50%. Reflecting the high degree of job protection in many European countries, UI is complemented by a relatively high firing tax equal to 50% of an annual salary. ALM policy is not used. The wage tax schedule is flat with a rate of 17,4%. Welfare policy in the initial equilibrium results in a high effective tax rate on job search. Despite of a substantial firing tax, the effective tax rate on firing is only moderately high. Net fiscal revenue triggered by firing is much reduced by the loss in sector 1 wage taxes due to job termination and by the need to pay UI benefits in the event of unsuccessful retraining. Finally, occupational choice is largely undistorted. The effective entry tax on sector 2 employment consists of the tax liability on a sector 2 job minus the foregone taxes on job continuation and job termination in sector 1.

Variables	BASE	UI	EP	FLEX	OPT	PROD
<i>Policy:</i>						
t_1 Tax sector 1	0.174	0.165	0.174	0.176	0.094	0.050
t_r Tax retrained	0.174	0.165	0.174	0.176	0.190	0.214
t_2 Tax sector 2	0.174	0.165	0.174	0.176	0.237	0.249
b_r Net repl. rate UI	0.500	0.413	0.408	0.426	0.413	0.417
t_s Firing tax EP	0.500	0.500	0.366	0.342	0.367	0.332
m ALM Policy	0.000	0.000	0.000	0.489	0.483	0.510
τ^E Eff. tax search	0.763	0.663	0.664	0.685	0.682	0.774
τ^S Eff. tax firing	0.247	0.316	0.177	0.155	0.290	0.329
τ^N Eff. tax entry	-0.009	-0.029	-0.010	-0.006	0.122	0.199
<i>Economic impact:</i>						
N Sector 2 entry	0.400	0.402	0.398	0.395	0.375	0.378
s Separation rate	0.250	0.250	0.302	0.312	0.302	0.316
e Reemployment rate	0.600	0.648	0.650	0.680	0.686	0.684
δ Unemployment rate	0.060	0.053	0.064	0.060	0.059	0.062
se Reallocation rate	0.150	0.162	0.196	0.212	0.207	0.216
w_1 Sector 1 wage	1.000	1.000	1.051	1.062	1.051	1.066
X_2 Sector 2 reallocated, %)	0.000	1.376	5.482	7.286	7.774	10.264
X_2 Sector 2 total, %)	0.000	1.789	5.326	6.779	2.996	15.057
X GDP, %)	0.000	0.837	1.488	2.130	1.844	7.721
V Welfare, *)	0.000	0.197	0.830	1.639	2.247	7.935

Legend: %) change in percent. *) Welfare change in % of GDP, $100 * (V - V_0) / GDP_0$. (BASE): flat taxes, exogenous flexicurity policies. (UI): BASE & optimal UI b . (EP): UI & optimal EP t_s . (FLEX): EP & optimal ALMP m . (OPT): FLEX & optimal taxes t_1, t_r, t_2 . (PROD): Productivity gain in sector 2 with optimal policy.

Table 1: Optimal Welfare Policies

As a first step, we optimally set UI benefits to satisfy condition (18), using the flat labor tax to fulfill budget balance. Clearly, optimal consumption smoothing by adjusting

benefits reflects a trade-off between risk-aversion and moral hazard. Compared to the base case, the replacement rate is cut by about nine percentage points, from 50 to 41%. The fiscal savings in unemployment insurance afford a tax cut by one percentage point. The net effect is a substantial reduction of the effective tax rate on job search and boosts the reemployment rate from 60 to 65%. The policy considerably inflates the effective firing tax, meaning that firing triggers a substantially higher overall net tax liability. Job separation is subject to a high and unchanged statutory rate t_s , but now involves lower benefits in the event of unemployment. The separation rate remains unchanged since the policy change does not address the firing margin. The scenario is less generous to sector 1 workers affected by job separation and, to a minor extent, shifts occupational choice in favor of sector 2. Sector 2 production benefits on both margins, job reallocation and slightly higher entry, leading to an expansion of 1.8 percentage points compared to column BASE. The unemployment rate significantly declines since fewer workers enter into the sector with high job termination and, more importantly, a larger part of job separations are successfully retrained. More successful reallocation of workers from the declining industry to the more productive sector 2 boosts GDP. The welfare gain is relatively small since the initial benefit level was not far from the optimal one.

The high (effective) tax rate on firing stands in the way of job reallocation which calls for a reduction in the firing tax, by about 13 percentage points, in line with the idea of flexicurity. The labor tax rates must rise to a minor extent to compensate the loss in firing tax revenue. Comparing to column UI reveals the differential effects of this step. UI benefits must be reoptimized, leading to a slightly lower replacement rate. Since the higher tax rate reduces disposable income after successful retraining, consumption smoothing requires a similar reduction in unemployment benefits. Given an almost unchanged income gap, incentives for job search and retraining are largely the same. Lower job protection triggers two major adjustments: the separation rate shoots up and competition forces firms to pass on the lower firing cost to workers by raising the wage rate by about 5% in sector 1. In spite of the higher unemployment incidence due to more separation, the prospects of higher wages shifts occupational choice towards sector 1. The net effect is

hardly noticeable, however. Given that optimal policy keeps up the reemployment rate at almost the same level, more frequent job separation leads to a higher unemployment rate of 6,4%, up from 5,3%, as well as a higher reallocation rate. In fact, sector 2 expansion by about 3,5% relative to column UI stems from substantial employment gains due to job reallocation while entry slightly dampens the expansion. Given the downsizing of sector 1 on account of increased job separation and given that the GDP share of sector 2 is only about 55%, GDP expands much more moderately by about 0.6% relative to the preceding step. The policy results in further welfare gains by reducing the overly high distortion against job reallocation.

Column FLEX includes active labor market policy for an optimal flexicurity policy. Note that for ALMP to be part of a welfare optimal policy, it must yield welfare gains to workers. Sanctions may be effective in enhancing job search but they clearly reduce private welfare. The scenario thus exclusively refers to job search assistance. The direct consequence is an increase in the reemployment rate. Since the government provides search incentives by assistance, it needs to rely less on financial incentives and thus affords a slightly higher replacement rate. Since ALMP spending reduces the net fiscal cost of firing, the government can allow more job separation and optimally reduce the firing tax. Since both the separation rate and the rate of successful retraining are higher, the policy results in a higher reallocation rate. Since the larger impact is recorded in increased search effort, the unemployment rate is reduced, by almost half a percentage point. For each worker moving out of unemployment into a job, the government saves on benefits and records higher tax payments. These double fiscal gains lead to substantial self-financing of ALM policy, especially so with a high effective tax rate τ^E in a generous welfare state, and keep the required increase in the tax rate very small. Since it benefits sector 1 workers by means of job search assistance, the policy change shifts occupational choice towards the declining industry, although the effect is rather negligible. Clearly, the economy's ability for greater job reallocation quite significantly expands sector 2 production but this output gain partly reflects the downsizing of sector 1 due to increased job separation. The net GDP gain is smaller but still amounts to more than half a percentage point.

Implementing ALMP as a last step towards the flexicurity model yields further welfare gains, almost doubling the gains from the first two policy steps.⁸ Compared to the initial situation in column BASE, the total welfare gain is equivalent to 1.6% of GDP.

As a last step towards a fully optimal welfare policy, column ‘OPT’ reports the consequences of moving towards an optimal tax structure and of reoptimizing all other elements of flexicurity. The three wage tax rates are solved to fulfill budget balance together with the optimality conditions (19-20). Note that more able individuals need to invest much less in required sector 2 qualifications than the marginal entrant. Given the large rents available to skilled workers, the government substantially redistributes from high to low wage earnings. The rate on sector 1 earnings is almost halved while the tax rate on high earnings in sector 2 is jacked up to 24% while the tax rate of retrained workers who also earn a high sector 2 wage, is raised only to a minor extent. By keeping t_r at a lower level, the government offers a substantial wage subsidy $t_2 - t_r$ to bring down the participation tax on job search. This redistribution policy has no direct bearing on sector 1 wages and the separation rate but boosts disposable wages of low skilled workers. Clearly, such strong redistribution favors entry into sector 1 at the expense of sector 2. The government complements this policy by slightly raising the firing tax and somewhat reducing the pressure on job separation. Using the wage subsidy to strengthen job search, the policy supports reemployment after a job loss. Still, the lower separation rate shrinks the reallocation rate to a minor extent. The part $es(1 - N)w_2$ of sector 2 output results from job reallocation which rises by roughly half a percentage point since the slightly lower reallocation rate applies to a substantially larger number of sector 1 workers as a result of increased entry into that sector. Increased reallocation dampens the otherwise substantial contraction of the productive sector. On net, sector 2 output declines by -3,8% relative to the FLEX scenario. Given the expansion of sector 1, the decline in GDP is much less pronounced and amounts to a mere .3%. Compared to the status quo, an optimal flexicurity policy yields welfare gains equivalent to 1.6% of GDP. Implementing an optimal tax policy on

⁸Clearly, the size of the gains should reflect the ‘distance’ of initial policies from their optimal choice. Given that current UI is already close to optimal, moving to optimal flexicurity cannot yield high gains.

top of this that pursues redistributive goals and contains search distortions with a wage subsidy, yields substantial further welfare gains equivalent to 0.6% and raises total gains of an optimal tax and welfare policy to 2.2% of GDP.

Flexicurity is often seen as an optimal response of welfare state design when technological innovation or globalization increase the pressure for structural change. We capture this by an exogenous 10% increase in sector 2 labor productivity. The larger earnings gap between sectoral wages raises demand for more redistribution and calls for a more progressive tax structure. Compared to column OPT, the lowest tax rate is reduced from 9,4 to 5% while tax rates on high earnings are raised by 2,4 and 1,2 percentage points, respectively. In consequence, reemployed workers receive a somewhat lower wage subsidy. Higher relative earnings in sector 2 boost the return to job reallocation. The government thus significantly reduces the firing tax, allowing a further increase in job separation. To keep up reemployment of separated workers, it intensifies efforts in ALM policies and thus relies relatively less on wage subsidies to incentivize reemployment. Overall, optimal welfare policy becomes more of the ‘flexicurity’ type. The rate of job reallocation significantly rises and is totally due to higher job separation. Since a larger increase is prevented by stepping up ALMP, frictional unemployment is only slightly higher. The productivity gain boosts output of the entire sectoral workforce, both reallocated and natural. Sector 2 expands by 11,6% relative to column OPT, and by 15,1% relative to the baseline scenario. A simple decomposition attributes 10% of the total output gain to increased productivity, 0,4% to occupational choice and 1,2% to job reallocation.⁹ Since sector 2 accounts for only 55% of gdp, the country’s gdp rises by much less but still by about 5,9%. The large welfare gain is, of course, mostly due to the exogenous productivity increase.

⁹Taking the differential yields $\frac{dX_2}{X_2} = \frac{dw_2}{w_2} + \frac{(1-es)w_2N}{X_2} \frac{dN}{N} + \frac{w_2es(1-N)}{X_2} \frac{des}{es}$. Relative to column FLEX in Table 1 we have 11,6% = 10% + 0,4% + 1,2%.

6 Conclusions

More turbulent economic times are characterized by globalization, rapid technological change and ongoing restructuring. Traditional sectors must downsize and shed jobs while highly productive and skill intensive sectors must attract labor to expand. The process of job reallocation leads to frictional unemployment and challenges the welfare state. It is often informally argued that the flexicurity model might be a better solution for an economy with ongoing structural change. Flexicurity rests on three pillars: (i) flexibility in firing if jobs turn out unproductive and labor would be better used somewhere else; (ii) social insurance to protect against the income risk of job separation; and (iii) active labor market policy to speed up labor reallocation and retrain workers for better jobs. This paper proposed a two sector model to analyze flexicurity where a downsizing sector is subject to earnings shocks and must shed jobs while an expanding sector offers better employment prospects with higher pay and more job security. Labor supply decisions support structural change on two margins. The first is an initial education decision where part of the workers invest in required qualifications to enter the high wage sector while others refrain from costly education and accept less demanding jobs in the traditional sector. The second channel is retraining of workers who are fired in the declining traditional industry for alternative employment in the expanding sector. Unemployment is thus concentrated among the low skilled when retraining and job search is not successful.

Within our framework, optimal welfare policy combines the design of a wage tax schedule with a flexicurity model of the welfare state and is characterized by (i) a progressive wage tax schedule; (ii) a wage subsidy to re-employed workers; (iii) relatively generous UI benefits; (iv) only moderate EP to contain excessive firing; and (v) ALMP to facilitate labor reallocation. We also show how this optimal policy enhances structural change by facilitating job reallocation from the declining to the expanding sector. Numerical illustrations show that going from a simple flat rate UI scheme to an optimal policy can substantially boost GDP and welfare and yet contain frictional unemployment. When the expanding sector gets more productive and the wage gap rises, the return to job

reallocation rises and welfare policy optimally shifts towards the ‘flexicurity model’.

References

- [1] Algan, Yann and Pierre Cahuc (2009), Civic Virtue and Labor Market Institutions?, *American Economic Journal: Macroeconomics* 1, 111-145.
- [2] Andersen, Torben and Michael Svarer (2014), The Role of Workfare in Striking a Balance between Incentives and Insurance in the Labour Market, *Economica* 81, 86-116.
- [3] Andersen, Torben and Michael Svarer (2007), Flexicurity - Labour Market Performance in Denmark, *CESifo Economic Studies* 53, 389-429.
- [4] Baily, Martin N. (1978), Some Aspects of Optimal Unemployment Insurance, *Journal of Public Economics* 10, 379-402.
- [5] Bartelsman, Eric, John Haltiwanger and Stefano Scarpetta (2013), Cross-Country Differences in Productivity: The Role of Allocation and Selection, *American Economic Review* 103, 305-334.
- [6] Bertola, Giuseppe (1990), Job Security, Employment and Wages, *European Economic Review* 34, 851-879.
- [7] Blanchard, Olivier and Pedro Portugal (2001), What Hides Behind an Unemployment Rate: Comparing Portuguese and U.S. Labor Markets, *American Economic Review* 91, 187-207.
- [8] Blanchard, Olivier and Jean Tirole (2008), The Joint Design of Unemployment Insurance and Employment Protection: A First Pass, *Journal of the European Economic Association* 6, 45-77.
- [9] Boeri, Tito and Juan F. Jimeno (2005), The Effects of Employment Protection: Learning from Variable Enforcement, *European Economic Review* 49, 2057-2077.
- [10] Boeri, Tito, J. Ignacio Conde-Ruiz and Vincenzo Galasso (2012), The Political Economy of Flexicurity, *Journal of the European Economic Association* 10, 684-715.
- [11] Brown, Alessio, Christian Merkl and Dennis Snower (2009a), Globalization and the Welfare State: A Review of Hans-Werner Sinn’s ‘Can Germany Be Saved?’, *Journal of Economic Literature* 47, 136-58.
- [12] Brown, Alessio, Christian Merkl and Dennis Snower (2009b), Incentives and Complementarities of Flexicurity, *WP 1526, Kiel Institute for the World Economy*.

- [13] Cahuc, Pierre and André Zylberberg (2008), Optimum Income Taxation and Layoff Taxes, *Journal of Public Economics* 92, 2003-2019.
- [14] Card, David, Jochen Kluge and Andrea Weber (2010), Active Labour Market Policy Evaluations: A Meta-Analysis, *Economic Journal* 120, F452-F477.
- [15] Chetty, Raj (2008), Moral Hazard versus Liquidity and Optimal Unemployment Insurance, *Journal of Political Economy* 116, 173-234.
- [16] Davoine, Thomas (2015), *A Theoretical Rationale for Flexicurity Policies Based on Education*, Economics Series 311, Institute for Advanced Studies, Vienna.
- [17] Davoine, Thomas and Christian Keuschnigg (2010), *Flexicurity and Job Reallocation*, Department of Economics Working Paper Series 2010-11, University of St. Gallen.
- [18] European Commission (2007), *Towards Common Principles of Flexicurity: More and Better Jobs Through Flexibility and Security*, COM(2007) 359 final.
- [19] Fredriksson, Peter and Bertil Holmlund (2006), Improving Incentives in Unemployment Insurance: A Review of Recent Research, *Journal of Economic Surveys* 20, 357-386.
- [20] Gentry, William M. and Glenn R. Hubbard (2004), The Effects of Progressive Income Taxation on Job Turnover, *Journal of Public Economics* 88, 2301-2322.
- [21] Gruber, Jonathan (1997), The Consumption Smoothing Benefits of Unemployment Insurance, *American Economic Review* 87, 192-205.
- [22] Heckman, James J., Robert J. Lalonde and Jeffrey A. Smith (1999), The Economics and Econometrics of Active Labor Market Programs, in: O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics III*, 1865-2097.
- [23] Holmlund, Bertil (1998), Unemployment Insurance in Theory and Practice, *Scandinavian Journal of Economics* 100, 113-141.
- [24] Hopenhayn, Hugo and Richard Rogerson (1993), Job Turnover and Policy Evaluation: A General Equilibrium Analysis, *Journal of Political Economy* 101, 915-938.
- [25] Immervoll, Herwig, Henrik J. Kleven, Claus T. Kreiner and Emmanuel Saez (2007), Welfare Reform in European Countries: A Microsimulation Analysis, *Economic Journal* 117, 1-44.
- [26] Krueger, Alan B. and Bruce D. Meyer (2002), Labor Supply Effects of Social Insurance, in: A. J. Auerbach and M. Feldstein (eds.), *Handbook of Public Economics IV*, 2327-2392.
- [27] Lazear, Edward (1990), Job Security Provisions and Employment, *Quarterly Journal of Economics* 105, 699-726.

- [28] Lechner, Michael, Ruth Miquel and Conny Wunsch (2011), Long-term Effects of Public Sector Sponsored Training in West Germany, *Journal of the European Economic Association* 9, 742-784.
- [29] Lentz, Rasmus and Dale T. Mortensen (2008), An Empirical Model of Growth Through Product Innovation, *Econometrica* 76, 1317-1373.
- [30] Ljungqvist, Lars and Thomas J. Sargent (1998), The European Unemployment Dilemma, *Journal of Political Economy* 106, 514-550.
- [31] Pavoni, Nicola andd Giovanni Luca Violante (2007), Optimal Welfare-to-Work Programs, *Review of Economic Studies* 74, 283-318.
- [32] Pissarides, Christopher A. (2001), Employment Protection, *Labour Economics* 8, 131-159.
- [33] Powell, David and Hui Shan (2012), Income Taxes, Compensating Differentials, and Occupational Choice: How Taxes Distort the Wage-Amenity Decision, *American Economic Journal: Economic Policy* 4, 224-247.