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Policy Complementarities: The Case for Fundamental Labor Market Reform

Prepared by David T. Coe and Dennis J. Snower*

August 1996

Abstract

This paper argues that an important group of labor market policies are complementary in the sense that the effect of each policy is greater when implemented in conjunction with the other policies than in isolation. This may explain why the diverse, piecemeal labor market reforms in many European countries in recent years have had so little success in reducing unemployment. What is required instead is deeper labor market reforms across a broader range of complementary policies and institutions. To be politically feasible, these reforms must be combined with measures to address distributional issues.

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E24, J6

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Policy Complementarities: The Case for Fundamental Labor Market Reform

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Summary

The message of this paper can be summarized in two simple points: a wide range of labor market institutions have complementary effects on unemployment: thus a correspondingly wide range of labor market reforms are also complementary. These complementarities mean that policies to reduce unemployment will be more effective if they are implemented together rather than in isolation.

This paper presents a search model that incorporates a variety of institutional features of European labor markets. In this model there is a striking interrelation between the government budget constraint and institutional features of the labor market: policies that are successful in lowering unemployment allow tax declines that encourage further reductions in unemployment. The model also describes a network of complementarities, which implies that changes in policies will have a greater effect on unemployment when implemented in conjunction than in isolation. A related result is that policy rigidities in one aspect of the labor market will reduce the effectiveness of labor market policy reforms in other areas. To be politically feasable, labor market reforms should be accompanied by policies to address the distributional consequences of reform and to achieve distributional objectives more efficiently. In this context, the paper shows how a change from an unemployment benefit system to a conditional negative income tax system can reduce unemployment.

Failure to take into account complementarities among unemployment policies may be one reason why the proliferation of recent labor market policy initiatives and reforms aimed at lowering unemployment in Europe have had such little effect. In the absence of complementarities, incremental and piecemeal reforms could, in principle, be effective. With complementarities, however, incremental and partial reforms are ineffective in comparison with "fundamental" labor market reforms, defined as reforms that are both deep and across a broad range of complementary policies and institutions.

I. Introduction

The message of this paper can be summarized in two simple points: (i) a wide range of labor market institutions - including unemployment benefits, job security legislation, and payroll taxes - have complementary effects on unemployment; (ii) thus a correspondingly wide range of labor market policies, aimed at reforming these institutions, are also complementary. Our definition of unemployment policy complementarities is straightforward: a group of policies is complementary when the unemployment effect of each policy is greater when it is implemented in conjunction with the other policies than in isolation. More generally and formally, a set of policy instruments x_i, $i = 1,...,n$, has complementary effects on a policy objective y when $\left(\partial^2 y / \partial x_i \partial x_j\right) > 0$ for $i \neq j$.

The rigidities in many European labor markets spring from a variety of sources: unemployment benefits, job security legislation, workers' bargaining power, welfare state entitlements, job search costs, barriers to entry of firms, barriers to mobility of labor, minimum wages, costs of human capital acquisition, and others. Our analysis investigates the channels whereby these rigidities are complementary to each other in their influence on unemployment. As we shall see, for example, when unemployment benefits discourage workers from seeking jobs and thereby reduce firms' payoff from seeking job applicants, this gives firing costs more leverage in discouraging firms from creating new jobs.[1] Not only do unemployment benefits magnify the unemployment effects of job security legislation, the same is also true the other way around, for when firing costs reduce firms' incentives to search for new recruits and thereby reduce unemployed workers' payoff from seeking jobs, this magnifies the disincentives to job search stemming from unemployment benefits. Our analysis shows that such institutional complementarities apply to a broad range of labor market rigidities.

Furthermore, when labor market institutions are complementary, then policies to reform these institutions are complementary as well. This implies that partial labor market reform is unlikely to achieve significant reductions in unemployment rates. For example, active labor market policies (such as job counseling and retraining schemes) may not be very effective in the presence of substantial passive policies (such as generous unemployment benefits and stringent job security provisions). By the same token, a scaling down of passive income support may have little effect on unemployment in the absence of active labor market policies. We contend that this may be an important reason why the diverse, piecemeal labor market reforms implemented in many European countries over the past decade and a half have had so little success in reducing long-term unemployment.[2] We argue that what is required, instead, is a thorough-going, many-handed approach, i.e. reforms that are both "broad" (covering a wide range of complementary policies) and "deep" (of substantial magnitude). These reforms must be combined with measures that address the distributional

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[1] It also gives insiders more leverage in pushing up wages - their own wages and those of new entrants - and thereby discourages job creation even further.

[2] This unsuccessful experience has been widely documented. See, for example, Katz and Meyer (1990), Houseman (1991), and Moffit (1992).

objectives of the pre-reform policies more efficiently. This is our case for fundamental labor market reform.

The paper is organized as follows. Section II discusses some key features of European labor markets, focusing on how labor market rigidities may be inter-related and mutually reinforcing, suggesting a role for complementary labor market policies. Section III presents a baseline formal model of some major institutional rigidities in the labor market. Section IV analyzes the associated policy complementarities. Sections V extends the model to distinguish between skilled and unskilled workers and to examine the role of training policies and minimum wages in this context. Section VI deals with redistributive policy. Section VII concludes.

II. Complementarities in European Labor Markets

It is widely recognized that there are many factors underlying the high European unemployment rates over the past two decades: aside from supply-side shocks and tight macroeconomic policies to reduce inflation, economists broadly agree that a variety of European labor market institutions have contributed to the unemployment problem.[3] We will argue that these institutional sources are complementary and thus suggest the need for a strategy of complementary labor market reforms.

The institutions usually identified as contributors to the high and persistent European unemployment include unemployment benefit systems and other welfare entitlement programs that discourage job search; high social insurance contributions that discourage employers from seeking employees (especially for low paying jobs) and workers from seeking jobs; school systems that do a poor job of preparing students for entrance to the labor market and ineffective public sector training programs; insufficiently competitive product and housing markets that restrain the demand for workers and reduce mobility; job security legislation that insulates incumbent employees from the forces of demand and supply; and union power, collective bargaining arrangements, and minimum wage laws that make wages unresponsive to market forces, prevent wage differentials from reflecting productivity differentials, and encourage the substitution of capital for labor.

It is not hard to see how these institutional rigidities reinforce one another. For instance, when unemployment benefits discourage workers from seeking jobs and when employers' social contributions discourage employers from seeking workers, these two effects augment one another since the workers' discouragement reinforces the employers' discouragement and *vice versa*. This nexus of effects is further reinforced by ineffective education and training, which can prevent workers from acquiring skills appropriate for the

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[3] See, for example, Lindbeck (1996), Alogoskoufis *et al.* (1995), IMF, (1994), and OECD (1994a).

available jobs. Furthermore, the effect of job security legislation on incumbent employees' bargaining power may be reinforced by labor immobilities arising in the housing market.

We will argue that these institutional complementarities point to policy complementarities and that the latter have not been adequately exploited in dealing with the European unemployment problem. Our underlying hypothesis is that the unemployment effect of a reform package depends significantly on its breadth (the range of complementary policies included in the package) and its depth (the size of the policy change). This hypothesis provides a conceivable explanation for a famous policy puzzle: European unemployment is certainly not the product of policy inaction. Over the past decade and a half, most European countries have undertaken a large number of labor market policy initiatives. These have covered not only passive policies, but have placed increasing emphasis on active labor market policies, so as to increase people's incentives to find work and acquire skills.[4] Nevertheless, these policies do not appear to have been particularly effective thus far. Why? Our analysis suggests one possible reason: the European policies initiatives have not been sufficiently "broad" and "deep". This is clearly not the only reason for the observed policy ineffectiveness, but it is one that has been largely ignored in the literature thus far[5] and we will argue that it is potentially important.

European governments are now spending enormous amounts on labor market programs. In recent years, spending on labor market programs has been equivalent to 3 ½ percent of GDP in Europe on average, and to 5 ½-7 percent of GDP in Denmark, Finland, and Sweden.[6] In most countries, only about one-third of total expenditures on labor market programs has been for active labor market policies with the remainder providing passive income support. These large expenditures on labor market programs have been financed by high and rising taxes and, in many countries, by increasing government deficits. The resulting tax wedge - income taxes plus employees' and employers' social security contributions - is very high in Europe compared with other industrial countries (Figure 1). These high taxes restrain demand and increase labor costs, both of which reduce employment. Widening budget deficits further exacerbate the problem by putting upward pressure on interest rates and reducing confidence. This constellation of problems suggests that complementarities between labor market policies and the tax system have contributed to the European unemployment problem.

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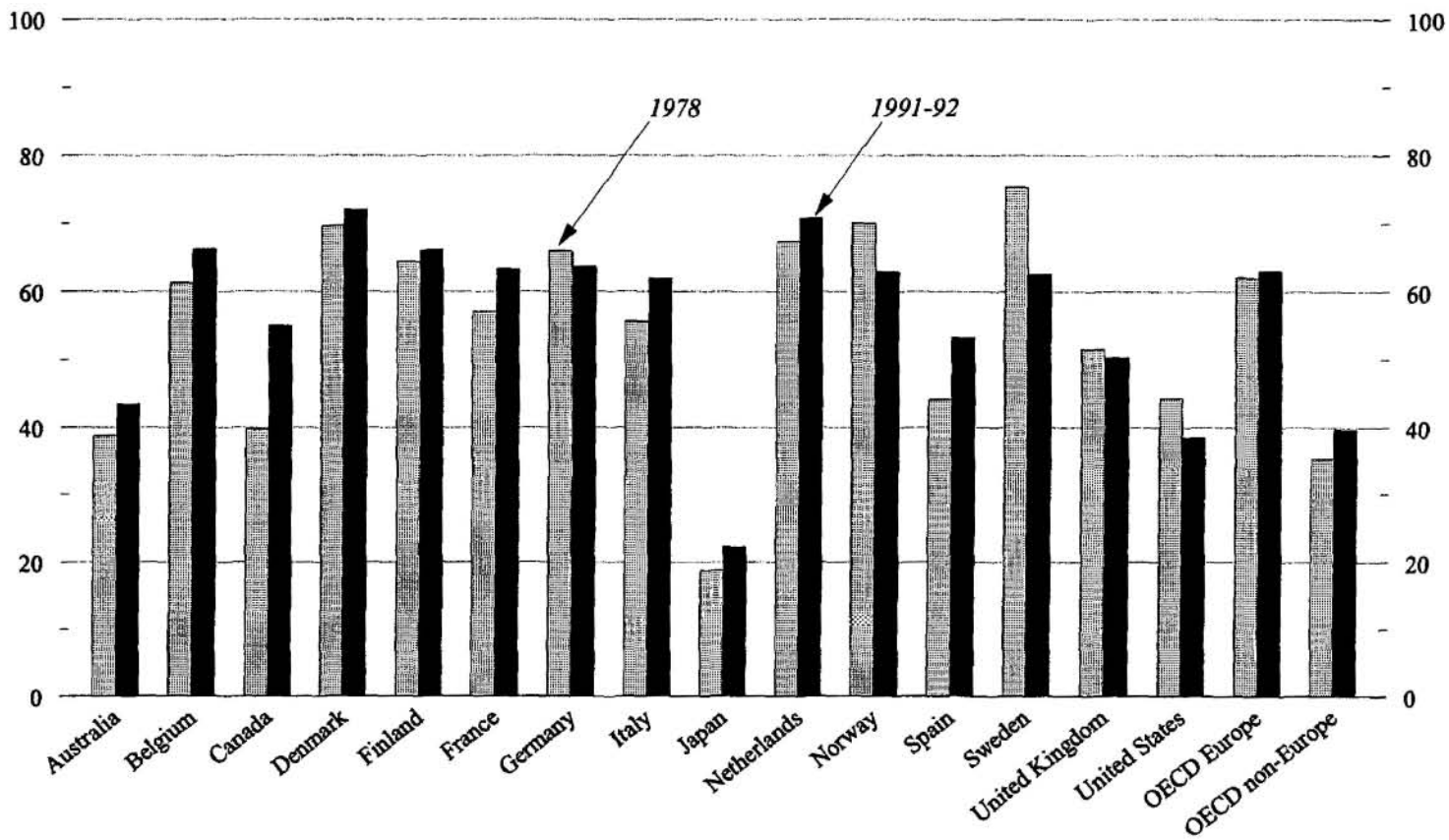
[4] This approach has been widely advocated, as, for example, in IMF (1994) and OECD (1990, 1994a).

[5] There are some exceptions, e.g. Bertola and Ichino (1995) and Lindbeck (1996); but these do not provide a rigorous analysis of policy complementarities. See also Calmfors (1994).

[6] These estimates are from the OECD (1995b) and refer to 1994 or the most recent year for which data are available. To put these figures in perspective, general government fiscal deficits are expected to average 4 percent of GDP in the European Union in 1996 (IMF, 1995), while the Maastricht deficit criteria is 3 percent of GDP.

Figure 1. Marginal Tax Wedges



Source: OECD (1994a, Part II), p.241. The overall tax wedge includes employees' and employers' social security contributions, personal income taxes, and consumption taxes.

It is not hard to find specific examples of isolated policy reforms, unaccompanied by complementary reforms in other areas, that have had little if any impact on unemployment. In the Netherlands, for instance, the statutory minimum wage was reduced or frozen with the aim of increasing employment among low skill workers (OECD, 1994b). There was however no reform of legislation on the coverage of wage agreements, i.e. the practice of automatic legal extension of wage agreements between specific unions and employers to cover all workers in the sector, even though the initial agreement may have only covered a relatively small proportion of workers in the sector. The upshot was that the real wages of low paid workers continued to increase at about the same pace as the private sector average, while their unemployment rate remained roughly double the overall rate.

The Spanish experience is also instructive in this context. In 1984 Spain attempted to promote labor market flexibility by introducing fixed-term labor contracts with low firing costs. The rapid expansion of fixed-term contracts allowed Spanish firms, which face some of the strictest job security regulations among the OECD countries (Figure 2), to buffer fluctuations in demand through changes in the number of fixed-term employees. Bentolila and Dolado (1994) argue that this reduced the risk of unemployment for workers with permanent contracts, which strengthened their bargaining position. Since wage bargaining agreements mainly reflect the interests of the insiders with permanent contracts, the result may have been less rather than more wage flexibility.[7] Thus, the introduction of fixed-term contracts without changes to the stringent job security regulations for workers with permanent contracts may have had perverse effects in terms of labor market flexibility and may have contributed to higher rates of unemployment. Recently Spain has reintroduced some restrictions on fixed term contracts and has reduced firing costs for all workers.

Over the 1990s France has implemented a very large number of labor market initiatives. Many of the labor market programs have been aimed at moderating the adverse employment effects of high minimum wages and payroll taxes - which remain among the highest of all OECD countries - through a variety of special programs, temporary exemptions, and other *ad hoc* measures (OECD, 1995a). Restrictions on part-time work have also been eased and worksharing has been encouraged. However, very little has been done in complementary areas such as improving training and education or reducing the stringency of job protection legislation and the power of insiders in the wage determination process.[8]

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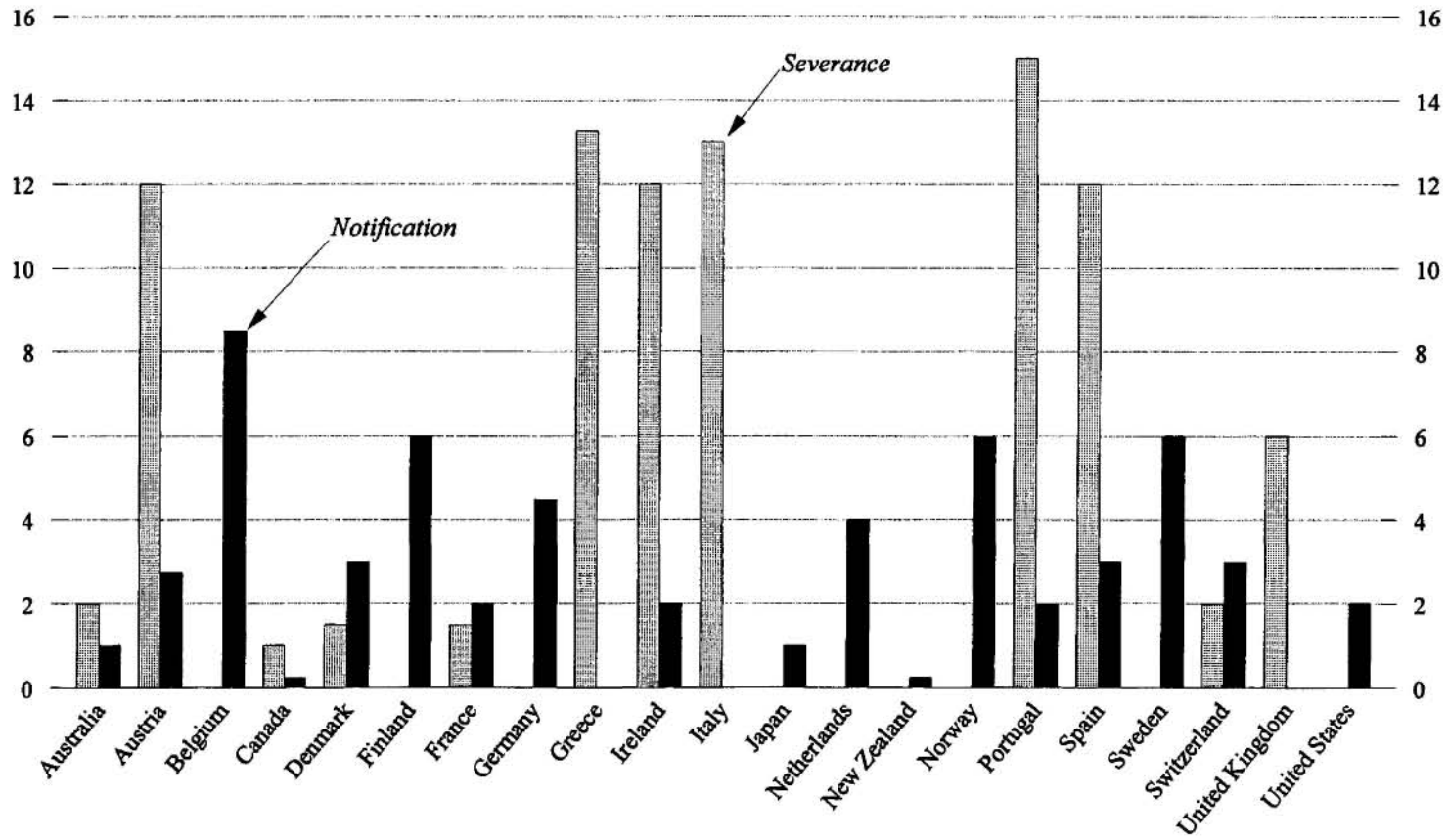
[7] See also Blanchard *et al.* (1995).

[8] The sheer number of special labor market initiatives and programs may itself have adverse effects on incentives, increase moral hazard problems, and reduce the ability of the government to monitor compliance and effectively administer the various programs; see Ljungqvist and Sargent (1995).

Figure 2. Maximum Notification and Severance Pay Periods

(1993, in months)



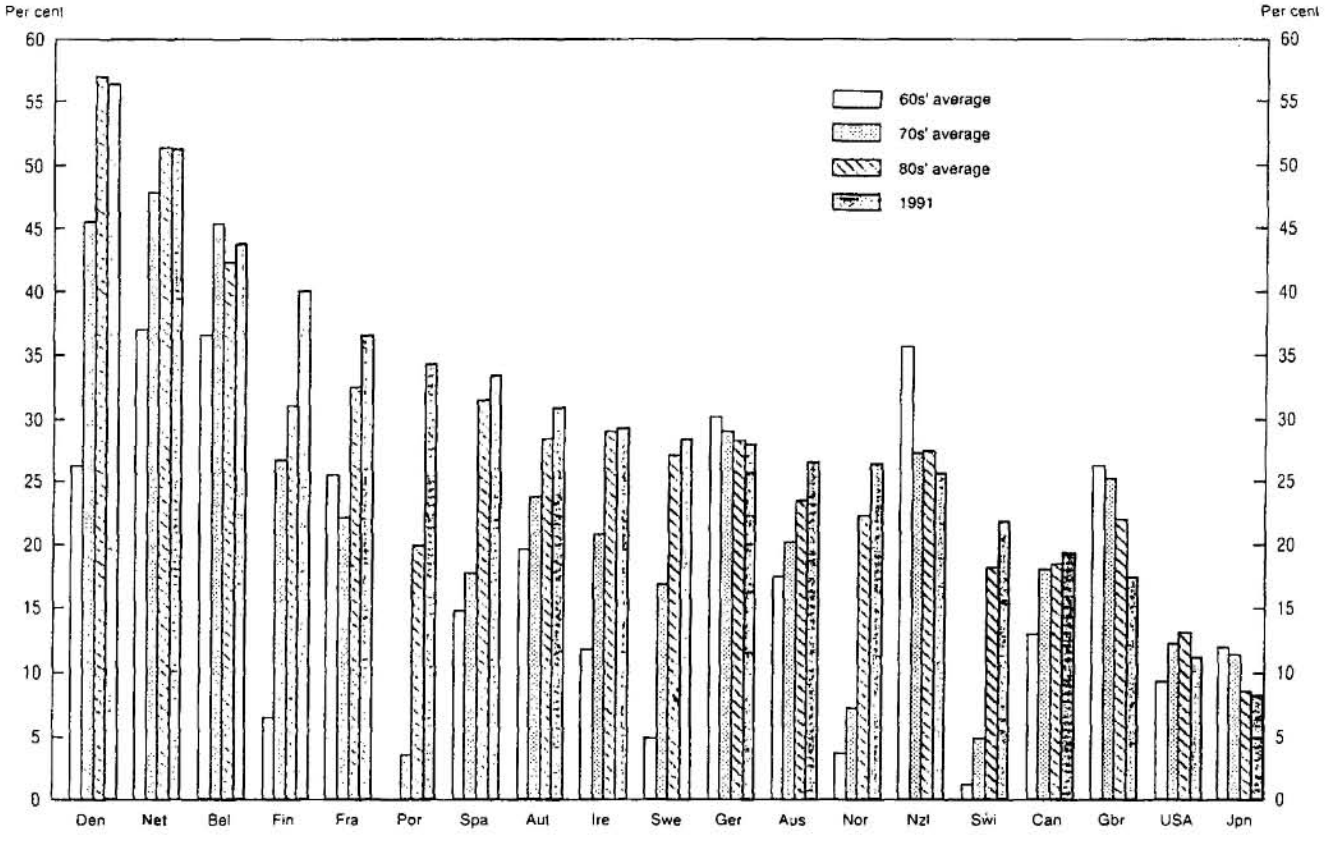
Source: OECD (1994a, Part II), p.73 except for the United States which is from U.S. Department of Labor (1989).

Over the 1980s the United Kingdom introduced substantial reforms, including legislation restricting strikes and secondary picketing, decentralization of wage bargaining, liberalization of hiring and firing restrictions, and reduction in the duration of unemployment benefits and tightening of the associated eligibility criteria. The wage councils, that had set minimum wages, were abolished. Job search by unemployed people was promoted through the Restart interviews and related measures. Mayhew (1991), Ramaswamy and Prasad (1994), and Henry and Karanassou (1996) have argued that these reforms have contributed to a fall in the equilibrium unemployment rate and to a steady decline in unemployment rates from 10½ percent in mid-1993 to 7 percent in mid-1996. The policy changes above, however, have not been accompanied by substantial reforms of other welfare-state entitlements such as housing benefits, or by a thoroughgoing drive to improve education and training systems. Furthermore, the U.K. labor market reforms have not been accompanied by major changes in the tax and transfer system to address the distributional consequences of the reforms.

The Swedish experience is also interesting from our perspective, since it focuses on a different subset of interrelated policies, while still falling far short of the full set of major policy complementarities. In Sweden unemployment benefits are of comparatively short duration and unemployed people have ready access to job counseling and training. However, the replacement ratios (the ratios of unemployment benefits to wages) are high, jobless people frequently have the opportunity of moving from unemployment benefits to training programs and back, and generous welfare state entitlements raise the attractiveness of inactivity relative to unemployment. Many observers have argued that these institutional factors help explain why Swedish unemployment grew so rapidly after the adverse shocks of the early 1990s, why it has remained high since then, and why its average working age is so low relative to the U.S. and even relative to most other European countries.

Many of the recent European labor market reforms have attempted to reduce the generosity of unemployment benefit systems, either through reductions in replacement rates, tightening of eligibility criteria, or shortening of benefit periods. In general, however, only marginal changes have been made to existing benefit systems (OECD, 1996) which remain generous compared with those in the United States or Japan (Figure 3). Moreover, there have been few, if any, major reforms to other types of passive income support programs or disability programs. These programs and other welfare-state benefits often function as alternatives to, or extensions of, unemployment benefits; reforming only one program may not do much to encourage job search and reduce long-term dependency if alternative forms of income support are available. The potentially large impact of benefit programs can be seen in the Netherlands, which has one of the most generous unemployment and disability benefit systems among the OECD countries, and where fully 17 percent of the working age population was receiving unemployment, disability, early retirement, or social assistance in 1993 (OECD, 1994b).

Figure 3. Unemployment Benefit Replacement Rates



Source: Reproduced from OECD (1994b), p. 87. Benefits before tax as a percent of previous earnings before tax.

It is clear that substantial reductions in benefit programs, and fundamental labor market reforms more generally, are politically difficult to implement. One of the main reasons is that reforms often have readily-identifiable distributional consequences for specific groups of people who will organize to oppose the reforms. This suggests the importance of a broad-based labor market reform programs that address the full range of rigidities and disincentives and do not appear to place the burden of reform unfairly on a specific group. It also suggests the importance of addressing distributional consequences directly by incorporating measures to achieve distributional objectives in a more efficient manner.

In sum, European countries have not, on the whole, sought to reduce unemployment by implementing a coherent strategy of fundamental reforms across a broad range of complementary policies. In the main, these countries have adopted a number of *ad hoc* measures that attempt marginal corrections to the most egregious distortions stemming from existing labor market policies or regulations. We argue that since only marginal, piecemeal changes have been implemented, existing restrictive institutions and regulations that are complementary to each other continue to interact, blocking the effectiveness of the recent reforms and prolonging unemployment.

In the next section, we present a simple, formal model that attempts to capture some of the major complementarities among labor market policies.

III. A Simple Model

We begin with a simple baseline model that covers a core set of institutional features that amplify each other's influence on unemployment: unemployment benefits, job security legislation, workers' bargaining power, costs of job search, and barriers to the entry of firms. The interactions among these institutions will suggest complementarities among policies aimed at institutional reform.

1. The Search for Workers and Jobs

Consider an economy in which output is produced by means of labor input. Let each employee generate real revenue a (a positive constant) and receive real wage w, so that the profit per employee (a - w) is positive. Let L be the size of the aggregate labor force (a positive constant) and V be the aggregate number of job vacancies. For simplicity (but without any substantial loss of generality), we assume that each worker lives for a single period. Thus, in each period, L workers enter the labor market.

These workers are engaged in either "constructive" or "unconstructive" job search. The constructive searchers want to work and are able to generate a revenue of a per worker. The unconstructive searchers are not willing to work; they are merely "pretending" to search in order to qualify for unemployment benefits (which are granted conditional on search). If they were hired, they would generate no revenue.

Employers are unable to distinguish a constructive from an unconstructive job searcher before making contact with the worker. At the beginning of each period of analysis, each employer searches for an employee by making a random drawing from the labor force. After contact has been made, the employer learns whether the worker is a constructive searcher. Since constructive searchers are willing to work while unconstructive searchers are not, both groups have an incentive to signal to their potential employers whether or not they would generate revenue upon being hired. Thus only constructive workers are hired.

A proportion $\theta*$ ($0 < \theta* < 1$) of the aggregate labor force searches constructively. The rate at which workers arrive at a vacancy and the rate at which vacancies arrive at a worker are given by Poisson processes. The probability that a vacancy is matched by constructive searcher may be expressed as:

$$\varepsilon = \varepsilon\left(\frac{\theta * L}{V}\right) \tag{1}$$

where $0 \leq \varepsilon \leq 1$, and $\varepsilon' > 0$ for $0 < \varepsilon < 1$. Similarly the probability that a constructively searching worker finds a job is given by

$$\rho = \rho\left(\frac{V}{\theta * L}\right) \tag{2}$$

where $0 \leq \rho \leq 1$, and $\rho' > 0$ for $0 < \rho < 1$.

The proportion θ^* of the workforce that searches constructively is determined as follows. Workers are assumed to be heterogeneous in terms of their constructive search costs. Let us order the workers in terms of these costs, from lowest to highest, and let θ stand for the proportion of the workforce ordered in this way. Then the marginal employee's cost of searching constructively is given by $e(\theta)$, $e' > 0$ for $0 < \theta < 1$, where the marginal employee is the last employee out of the proportion θ of the ordered workforce.[9] Unconstructive search is assumed to have zero cost.

With probability ρ, a constructive searcher finds a job and receives wage income $w(1-t)$, where t is the income tax rate (a positive constant);[10] with probability $(1-\rho)$ she does not find a job and receives the unemployment benefit b. Thus the marginal worker's return from constructive search is $\rho w(1-t)+(1-\rho)b-e(\theta)$. If, on the other hand, she does not search constructively, she is certain not to get a job offer and thus her return is simply b. In equilibrium ($\theta = \theta^*$), the marginal searcher is indifferent between constructive and unconstructive search, so that

$$\rho w(1-t)+(1-\rho)b-e(\theta^*)=b \tag{3}$$

The unemployment benefit is assumed to be proportionately related to the wage:

$$b = \beta w(1-t) \tag{4}$$

where β is the replacement ratio. Thus, by (3) and (4), the proportion of the workforce that searches constructively is

$$\theta^* = e^{-1}\left[\rho w(1-t)(1-\beta)\right] \tag{5}$$

2. The Supply of Vacancies

To supply a vacancy, the employer must pay a fixed cost κ (a positive constant). Thus the profit from searching for an employee is

$$\pi = \varepsilon\left(\frac{\theta L}{V}\right)(a-w)-\kappa \tag{6}$$

The probability ε of finding a constructive job searcher, the revenue a, the wage w, and the entry cost κ are all known to the employer when the vacancy supply decisions are made.

Under free entry, vacancies are supplied until the associated profit is driven to zero: $\pi = 0$. By (6), this implies that the aggregate level of vacancies V that emerges in response to the aggregate number of constructive job searchers θL is given by

$$\frac{\theta L}{V} = \varepsilon^{-1}\left(\frac{\kappa}{a-w}\right) \tag{7}$$

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[9] In other words, the cumulative distribution of constructive job search costs is approximated by a continuum given by the function $e(\theta)$.

[10] For simplicity, we assume that employers are not taxed. Including employers' taxes would not affect the substance of our analysis.

3. Wage Determination

After an employer has found a constructive job searcher, they negotiate the wage, which is the outcome of a Nash bargain. Under bargaining agreement, the employee[11] receives $w(1-t)$; and the employer receives $(a - w)$. The employee's fall-back position is assumed to be equal to her unemployment benefit b. The employer's fall-back position is assumed to depend on the firing costs in the following simple way. Under bargaining disagreement, the employee engages in industrial action that is costly to the employer but not the employee. The greater is the level of industrial action, the lower will be the employer's fall-back position and thus the higher will be the wage that the employee can achieve, up to a limit, beyond which the employer has an incentive to fire the employee. The employer faces a fixed firing cost of f per employee. If the cost of the industrial action to the employer exceeds the firing cost f, the employee will be replaced by a new recruit. Consequently the employee will set the level of industrial action so that its cost to the employer is exactly f, making the employer indifferent between retaining and replacing the employee.

In sum, the employee's bargaining surplus is $w(1-t) - b$ and the employer's bargaining surplus is $a - w - (-f)$. Let the firing cost f be proportional to the wage: $f = \phi w$, where ϕ is a constant, $0 < \phi < 1$. Then the employer's surplus becomes $a - (1-\phi)w$. Thus the Nash bargaining problem is

$$\underset{w}{Maximize}\left(w(1-t)-b\right)^{\mu}\left(a-(1-\phi)w\right)^{1-\mu}$$

where μ (a constant, $0 < \mu < 1$) is the bargaining strength of the employee relative to the employer. Noting that the value of the unemployment benefit b is taken as exogenously given in the bargain but that, in equilibrium, the unemployment benefit is proportional to the wage (equation (4)), the equilibrium negotiated wage becomes

$$w = \alpha\frac{a}{1-\phi} \tag{8a}$$

where

$$\alpha \equiv \frac{\mu}{1-(1-\mu)\beta} \tag{8b}$$

4. The Unemployment Rate

The unemployment rate is

$$u = 1 - \theta\rho \tag{9}$$

Define the ratio of vacancies to constructive job searchers as our measure of labor market "tightness" (τ):

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[11] Since profits are reduced to zero through free entry, each worker's income is equal to her wage income.

$$\tau \equiv \frac{V}{\theta L} \tag{10}$$

Then, by (7) and (8a,b), the equilibrium degree of tightness is

$$\tau^* = \left[\varepsilon^{-1} \left(\frac{\kappa}{a\left(1-\alpha/(1-\phi)\right)} \right) \right]^{-1} \tag{11}$$

Thus, by (5), (7), (8a,b), and (9), the equilibrium unemployment rate is:

$$u^* = 1 - \rho(\tau^*) e^{-1} \left[\rho(\tau^*) \alpha \frac{a}{1-\phi} (1-t)(1-\beta) \right] \tag{12}$$

5. The Government Budget Constraint

Our model of the labor market is closed through a government budget constraint, showing that the government's spending on unemployment benefits is equal to its tax receipts:

$$(1-\theta\rho) L \beta w = t w \theta \rho L \tag{13}$$

where the left-hand side stands for unemployment benefit payments (since $(1-\theta\rho)L$ is the level of unemployment and βw is the unemployment benefit per person) and the right-hand side is tax receipts (since $\theta\rho L$ is the level of employment, $w\theta\rho L$ is aggregate income, and t is the income tax rate).

In equilibrium, the government budget constraint becomes

$$\rho\theta = \rho(\tau^*) e^{-1} \left[\rho(\tau^*) \alpha \frac{a}{1-\phi} (1-t^*)(1-\beta) \right] = \frac{\beta}{\beta + t^*} \tag{13'}$$

6. The Labor Market Equilibrium and the Tax-Benefit Multiplier

Equations (11), (12), and (13') describe the complete labor market equilibrium. First, given the equilibrium wage (8a) and the free-entry condition (7), equation (11) yields the equilibrium degree of labor market tightness, τ^*. Second, this equilibrium degree of labor market tightness τ^* determines the equilibrium probability of finding a job ($\rho^* = \rho(\tau^*)$, by equation (2)) and, given ρ^*, equation (12) yields the equilibrium unemployment rate for any given tax rate t. And finally, given ρ^*, equation (13') yields the tax rate t^* which balances the government's budget.

Thus the labor market equilibrium may be represented as the solution of the following system:

$$u^* = 1 - \rho(\tau^*) e^{-1} \left[\rho(\tau^*) \alpha \frac{a}{1-\phi} (1-t)(1-\beta) \right] \tag{12}$$

$$u^* = 1 - \theta^* \rho(\tau^*) = \frac{t}{\beta + t} \tag{13''}$$

where the former may be interpretted as describing the equilibrium unemployment rate for any given tax rate, and the latter is a restatement of the government budget constraint, describing the tax rate that balances the budget for any given unemployment rate.

Figure 4 pictures this system. Here the *UE* curve represents the "unemployment equilibrium" equation (12) and the *GBC* curve represents the "government budget constraint" (13"). The labor market equilibrium is given by the intersection of these two curves.[12]

Our model reveals a striking interrelation between the tax system and various institutional features of the labor market. The following example illustrates this point clearly. Suppose that the labor market is initially in equilibrium, denoted by point E_o in the figure. At this equilibrium, the unemployment rate is u_0 and the tax rate is t_0. Now suppose that the replacement ratio β is reduced. The chain reaction of resulting effects is illustrated in Figure 4. In this exercise we assume - as in usually the case in practice - that the elasticity of labor demand is less than -1: $(\partial\rho / \partial w)(w / \rho) < -1$. The reason for this assumption is that the wage has a direct, negative effect on the employment probability $\rho*$, but it also has two countervailing effects on the proportion $\theta*$ of constructive job searchers, since it raises the return from constructive search by raising the wage and reduces that return by reducing the employment probability $\rho*$. If the elasticity of labor demand is less than -1, the latter of these countervailing effects dominates the former, and consequently a rise in the wage unambiguously raises the unemployment rate.

The impact effect of a fall in the replacement ratio β is described by equation (12). For any given tax rate (t), a fall in β has three effects on the unemployment rate: (i) it has a direct expansionary effect on the proportion $\theta*$ of the labor force engaged in constructive job search, (ii) it puts downward pressure on the negotiated wage (via α), raising expected wage income, and thereby stimulating the proportion $\theta*$ indirectly, and (iii) it increases the degree of labor market tightness, via the wage. Through all three channels, the unemployment rate falls: $(\partial u*(t) / \partial\beta) > 0$. Thus the *UE* curve shifts downwards from *UE* to *UE'* in Figure 4. At the initial equilibrium tax rate t_0, the unemployment rate consequently falls from u_0 to u_1 in the figure.

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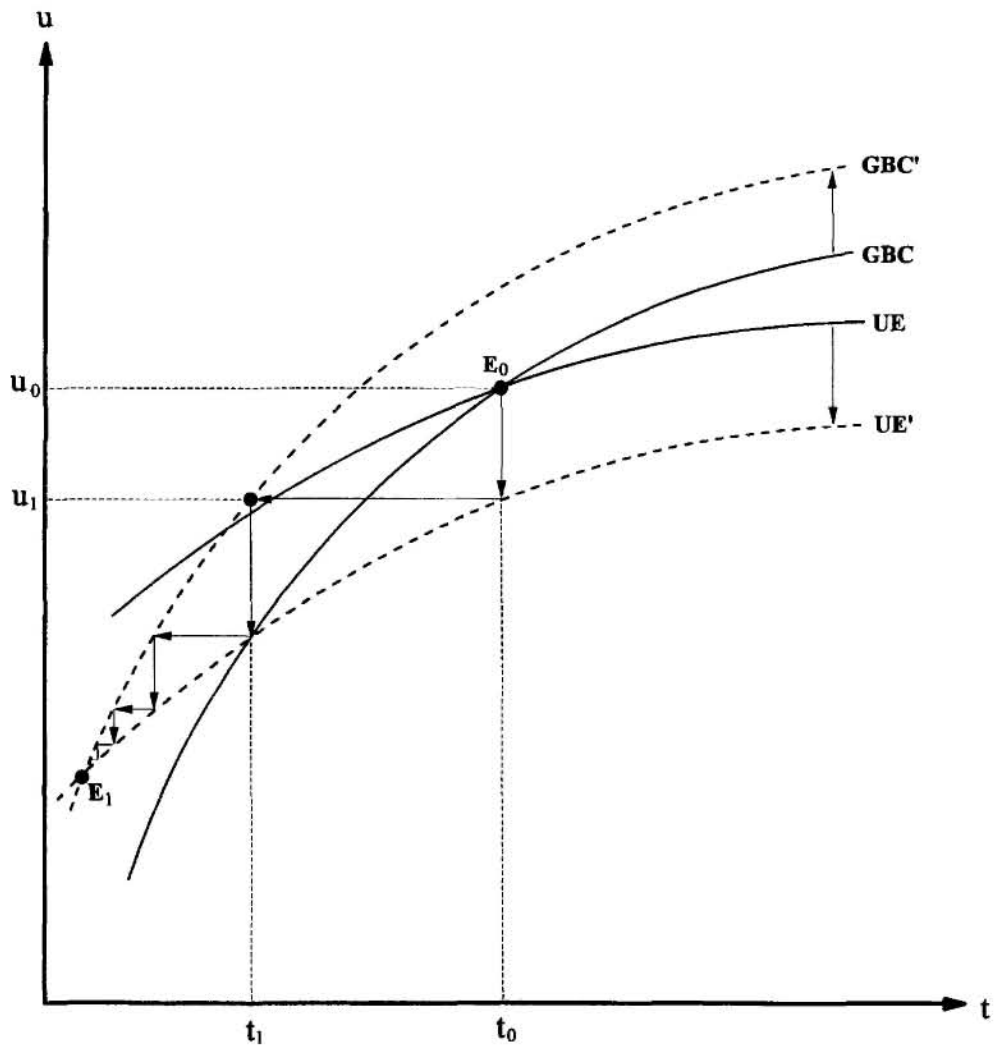
[12] The relative slopes of these curves is determined by correspondence-principle considerations: Given the equilibrium at point E_0, if the unemployment rate were above u_0, the tax rate associated with this unemployment rate (on the UE line) would be greater than the tax rate that balances the government's budget (on the GBC line), and thus it is possible to reduce the unemployment rate through a tax reduction. On the other hand, if the unemployment rate were below u_0, the tax rate associated with this unemployment rate (on the UE line) would be less than the tax rate necessary to balance the government's budget (on the GBC line), and thus such an unemployment rate is not feasible. (Clearly, if this condition were not satisfied in equilibrium, then it would be possible to reduce the unemployment rate to zero through a sufficiently large tax reduction.)

Figure 4. Labor Market Equilibrium and the Tax-Benefit Multiplier



Furthermore, the government budget constraint shifts upwards from *GBC* to *GBC'* in the figure. The reason is given in equation (13"): at any given unemployment rate u, the lower is the replacement ratio β, the lower must be the tax rate t in order for government spending on unemployment benefits to remain equal to tax receipts.

The resulting sequence of unemployment multiplier effects is straightforward. The fall in the replacement rate β and the consequent decline in the unemployment rate from u_0 to u_1 reduce the government's unemployment benefit payments and broaden the tax base, and thereby lead to a fall in the equilibrium tax rate. By equation (13'), for a given unemployment rate ($1-\theta\rho$) and employment rate $\theta\rho$, the fall in the tax rate induced by a fall in the replacement ratio is

$$\frac{\partial t}{\partial \beta} = \frac{1-\theta\rho}{\theta\rho} > 0$$

This initial drop in the tax rate is illustrated by the movement from t_0 to t_1 in the figure.

The fall in the tax rate, in turn, raises the proportion θ^* of constructive job searchers, which leads to a fall in the associated unemployment rate:

$$\frac{\partial u^*}{\partial t} = \rho(\tau^*)(e^{-1})'\rho(\tau^*)\alpha\frac{a}{1-\phi}(1-\beta) > 0$$

by equation (12), and increases the employment rate by an equal amount. This calls for a further fall in the tax rate (by equation (13')), and so on.

The upshot is a *tax-benefit multiplier*, whereby a reduction in the replacement ratio leads to a succession of tax cuts, in response to the induced employment and unemployment repercussions. By equation (13'), this multiplier[13] is

$$\frac{dt}{d\beta} = \frac{t+\rho(\tau^*)(e^{-1})'\alpha(a/(1-\phi))(b+t)^2(1-t)}{1-\rho(\tau^*)(e^{-1})'\alpha(a/(1-\phi))(b+t)^2(1-\beta)} > 0 \qquad (14)$$

On account of the tax-benefit multiplier, the labor market equilibrium moves from E_0 to E_1 in the figure.

We now turn to the role of policy complementarities in this labor market.

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[13] The multiplier is unambiguously positive since it can be shown that the denominator is positive when the labor demand elasticity is less than -1.

IV. Policy Complementarities

The model above describes a network of complementarities among various labor market institutions (e.g. unemployment benefits, firing costs, barriers to job creation), implying an analogous network of complementarities among labor market policies.

We will examine the complementary influences of the following policies on unemployment:

- Job creation measures: policies that reduce the barriers to job creation (κ), e.g. through tax reform or relaxation of regulations governing the entry and exit of firms.
- Reform of job security legislation: policies that reduce the firing cost ratio (ϕ).
- Search promoting measures: policies to reduce labor market search costs, which we capture through shift parameters ε^o, ρ^o, and e^o of the functions ε, ρ, and e, respectively.[14] These policies include job counseling, information provision to unemployed workers and firms with vacancies, and mobility promoting measures such as relocation subsidies or travel grants.
- Unemployment benefit reform: reducing the replacement ratio (β).
- Reform of the wage bargaining system: reducing the bargaining strength of incumbent employees (μ).

Whereas some of these policies can be implemented through legislative change, others - especially the search-promoting measures - require government spending to be put into effect. For simplicity, we reinterpret the replacement ratio β to include such government spending on the relevant unemployment policies.

Our main thesis regarding the effectiveness of the unemployment policies above may be summarized by the following proposition:

Proposition 1: For the labor market equilibrium described by equations (11), (12), and (13'), the labor market policies given above are complementary, i.e. they have a greater effect on unemployment when implemented in conjunction than in isolation.

The policy complementaries are implicit in equations (11), (12), and (13'); some of the main ones are illustrated in Figure 5. For example, suppose that the labor market is initially in equilibrium, whereupon the unemployment benefit b is reduced, implying a fall in the replacement ratio β. This change has two effects on the unemployment rate: (a) a direct effect whereby a fall in the replacement ratio raises the proportion of contructive job

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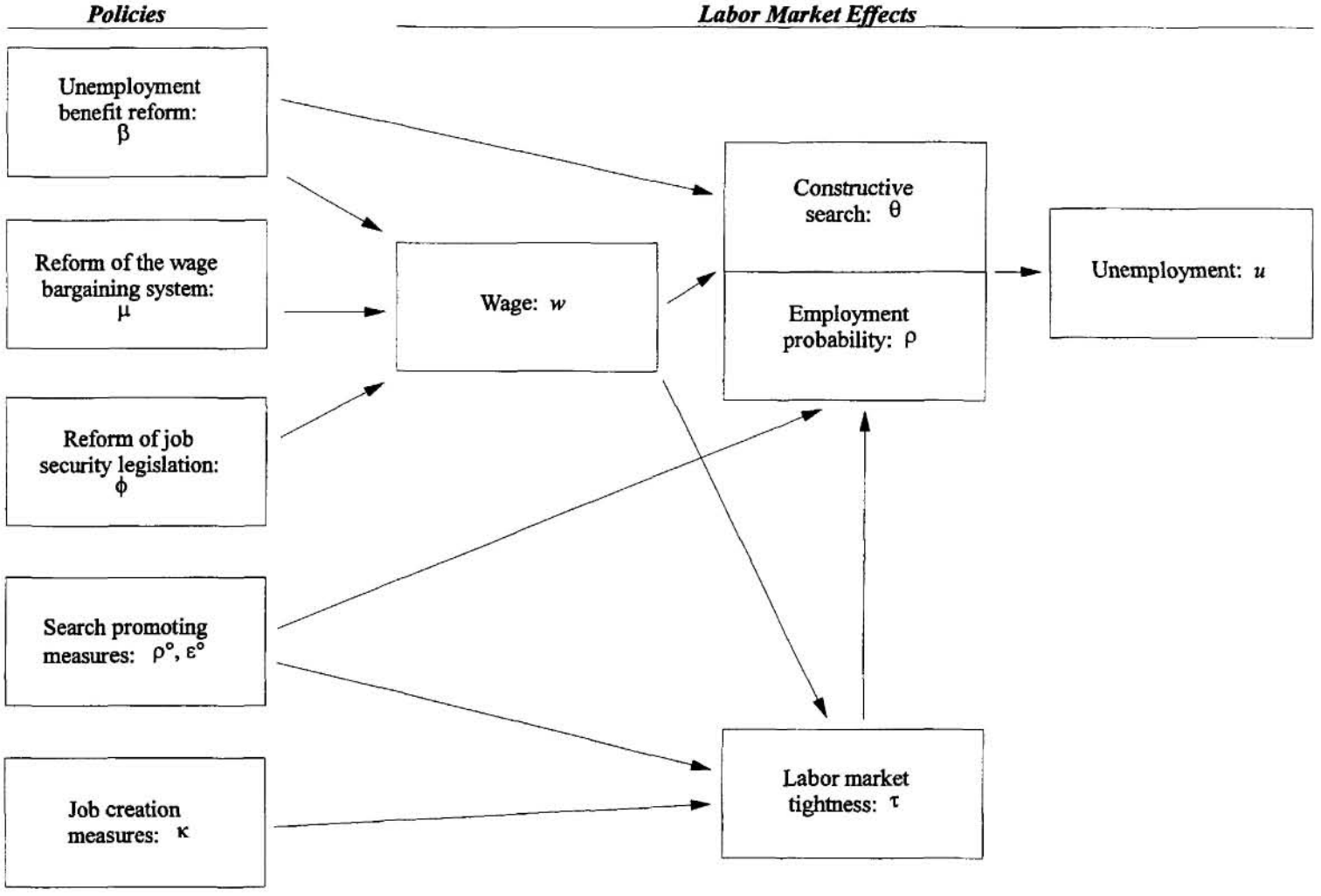
[14] Specifically, ε^o is a shift parameter that reduces the probability (ε) that a vacancy is matched by a constructive searcher for any given degree of labor market tightness (τ), and similarly for the shift parameters ρ^o and e^o.

Figure 5: Policy Complementarities



searchers (pictured by the arrow from β to θ), and thereby reduces the unemployment rate; and (b) an indirect effect whereby the fall in the replacement ratio reduces the wage (pictured by the arrow from β to w), and thereby raises the employment rate and reduces the unemployment rate.[15] Observe that, by equations (5) and (8), the direct effect can be amplified by a drop in the firing cost ϕ, through policies that reduce the market power of employees (thereby reducing μ),[16] and through search-promoting measures that increase ρ^o. By the government budget constraint (13'), this amplification permits a fall in the tax rate t and (by equation (5)), this further amplifies the unemployment effect of the fall in the replacement ratio. Finally, job creation measures that reduce κ and search-promoting measures that raise ε^o both serve to increase the degree of labor market tightness τ (by equation 11), thereby raising the employment probability ρ, which also amplifies the unemployment effect above.

Figure 4 offers another way of visualizing these complementarities. Specifically, consider the complementarities between unemployment benefit reform (reducing β) and the job creation measures (reducing κ). As shown in Section III, a fall in the replacement ratio β shifts the *UE* curve downwards and the *GBC* curve upwards in the figure, giving rise to a tax-benefit multiplier. The size of this multiplier depends on the relative slopes of the *UE* and *GBC* curves. A fall in κ leaves the *GBC* curve unchanged, but increases the slope of the *UE* curve. To see this, observe that, for any given tax rate t, the effect of the replacement ratio on the unemployment rate is

$$\left.\frac{\partial u^*}{\partial \beta}\right|_{UE} = \rho(\tau^*)e^{-1}\left[\rho(\tau^*)\alpha\frac{a}{1-\phi}(1-t)\right]$$

by equation (12). Also note that $(\partial\tau^*/\partial\kappa) < 0$, by equation (11); thus, $(\partial\rho(\tau^*)/\partial\kappa) < 0$. Furthermore, expected income $\rho(\tau^*)\alpha a/(1-\phi)$ is inversely related to κ since the elasticity of demand is less than -1. Consequently, $(\partial^2 u^*/\partial\beta\partial\kappa) > 0$.

In other words, a fall in barriers to job creation (κ) makes the *UE* curve steeper and thereby increases the tax-benefit multiplier. This means that a fall in the replacement ratio (β) has a more powerful contractionary effect on unemployment when it is accompanied by a fall in barriers to job creation (κ) than when it is implemented in isolation.

Analogous arguments can be made with regard to the complementarities between the other policies above.[17] These complementarities are summarized in the Table 1.[18]

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[15] As discussed in the previous section, the effect of the wage on unemployment operates via τ, ρ, and θ.

[16] Recall that, under the assumption that the elasticity of labor demand is less than -1, the resulting fall in the wage will raise wage income ρw.

[17] Recall that the search-promoting measures involve government expenditures which, in the context of the analysis above, increase the coefficient β (reinterpreted to include these

Table 1: Policy Complementarities

$\frac{\partial^2 u}{\partial\kappa\partial\phi} > 0$	$\frac{\partial^2 u}{\partial\kappa\partial\gamma_i} > 0$	$\frac{\partial^2 u}{\partial\kappa\partial\beta} > 0$	$\frac{\partial^2 u}{\partial\kappa\partial\mu} > 0$
	$\frac{\partial^2 u}{\partial\phi\partial\gamma_i} > 0$	$\frac{\partial^2 u}{\partial\phi\partial\beta} > 0$	$\frac{\partial^2 u}{\partial\phi\partial\mu} > 0$
		$\frac{\partial^2 u}{\partial\gamma_i\partial\beta} > 0$	$\frac{\partial^2 u}{\partial\gamma_i\partial\mu} > 0$
			$\frac{\partial^2 u}{\partial\beta\partial\mu} > 0$

where γ_i, $i = 1,2,3$ is defined as $\gamma_1 = \varepsilon^o$, $\gamma_2 = \rho^o$, and $\gamma_1 = e^o$

The following corollary of the above proposition provides a different perspective on the policy complementarities:

Corollary 1: In the context of the model, a restrictive labor market policy - such as one leading to a high firing cost ratio (ϕ), a high replacement ratio (β), high labor market search costs (ε^o, ρ^o, and e^o), or a high cost of job creation (κ) - reduces the effectiveness of the other labor market policies.

In other words, a single severe institutional rigidity can sabotage all other efforts at labor market reform. This result is also evident from Figure 4. A high replacement ratio β, for instance, means that the slope of the *UE* curve will be flat. (In the extreme case in which $\beta =$

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expenditures). We assume that the direct contractionary effect of these measures on unemployment outweighs their indirect expansionary effect via the increase in β.

[18] It is important to note that the policy complementarities associated with job security legislation arise because reductions in firing costs reduce unemployment in our model. However the unemployment effect of firing costs is a matter of controversy in the literature. Bentolila and Bertola (1990) argue that when the labor market faces permanent shocks, firing costs tend to stimulate, rather than reduce, employment. Bentolila and Saint-Paul (1994) show that firing costs may reduce employment when the shocks are transient. Snower and Vazquez (1996) show that when firing costs influence employment both directly (as in Bentolila and Bertola, 1990, and Bentolila and Saint-Paul, 1994) and indirectly via wage determination, their average effect on employment depends on how prolonged the shocks are. The model here does not include the possibility of firing, and thus the firing cost affects employment *only* indirectly via the wage. Then a rise in the firing cost unambiguously raises the unemployment rate.

1, the *UE* curve is horizontal.) Consequently, policies that reduce barriers to job creation κ will have little effect on the unemployment rate. Once again, the same may be said of other combinations of unemployment-reducing policies and restrictive labor market practices.

Proposition 1 has an important implication for the interaction between "active" and "passive" unemployment policies. According to the usual usage, active policies are those that provide the unemployed with incentives to find jobs, whereas passive policies are ones that provide income support for those who do not find jobs. For example, job counseling that reduces the job search cost e^o is an active policy, whereas the unemployment benefit system that determines the replacement ratio β is a passive policy. The interdependence of active and passive policies may be summarized as follows:

Corollary 2: The more generous are passive unemployment policies, the less effective will be active unemployment policies.

In terms of the example above, the greater is the replacement ratio β, the smaller will be the effect of the job counseling (that reduces e^o) on the unemployment rate. Corollary 2 provides a possible explanation for why many European countries with generous passive unemployment policies have had so little success with their active ones.

It is however important to note that a motivation for some existing institutional rigidities, such as unemployment benefits and firing costs, is to provide support for the unemployed and job security for the employed; thus policies that reduce these rigidities must be accompanied by further measures that address these distributional objectives. After all, reductions in unemployment are rarely if ever the only objective of labor market policy makers. The challenge of policy formulation is to find a set of complementary reforms that have a powerful joint effect on unemployment without creating a socially undesirable widening of the distribution of income. Before addressing the distributional issue (in Section VI), the next section extends our analysis to consider complementarities between the policies discussed above and those affecting human capital acquisition.

V. Extensions

Since high unemployment tends to be a problem concentrated particularly among unskilled workers, we now broaden model to include the distinction between unskilled and skilled workers and the training process whereby the former turn into the latter. In this context we show how the effect of human capital acquisition costs on the unemployment rate is magnified by each of the institutional rigidities considered above, implying that the unemployment-reducing policies above are complementary with those that reduce the cost of acquiring skills. We will also examine the unemployment effect of minimum wages in this context.

1. Complementarities with the Costs of Human Capital Acquisition

Let the exogenously given labor force L be divided into M_s skilled workers and M_n unskilled ones (where the subscript n stands for "not skilled"), and let the aggregate number of vacancies be divided into V_s skilled ones and V_n unskilled ones. Only the skilled employees are capable of working at skilled jobs; in case of a match, each skilled employee generates a real revenue a_s. Both the unskilled and skilled employees are capable of working at the unskilled jobs, where the real revenue per person is a_n, with $a_n < a_s$. We assume that employers are able to distinguish between skilled and unskilled workers prior to making specific matches, so that employers search exclusively among skilled workers to fill their skilled vacancies. Let θ_s^* and θ_n^* be the proportion of the skilled and unskilled workforces (respectively) that are engaged in constructive job search. Then the ratio of constructive job searchers to vacancies in the skilled sector is $(\theta_s^* M_s/V_s)$; but in the unskilled sector it is $\theta_n^*(L-M_s)/V_n$, since those skilled workers who are unable to find skilled jobs are available for unskilled ones.[19]

Let ε_s and ε_n be the probability that a skilled vacancy is matched by a skilled worker and that an unskilled vacancy is matched by an unskilled worker, respectively. These probabilities are

$$\varepsilon_s = \varepsilon_s\left(\frac{\theta_s * M_s}{V_s}\right), \quad \varepsilon_n = \varepsilon_n\left(\frac{\theta_n *(L-M_s)}{V_n}\right) \tag{15a}$$

where $0 \le \varepsilon_i \le 1$, and $\varepsilon_i' > 0$ for $0 < \varepsilon_i < 1$, for $i = s, n$. Furthermore, the probability ρ_s that a skilled worker finds a skilled job, and the probability ρ_n than an unskilled worker finds an unskilled job is

$$\rho_s = \rho_s\left(\frac{V_s}{\theta_s * M_s}\right), \quad \rho_n = \rho_n\left(\frac{V_n}{\theta_n *(L-M_s)}\right) \tag{15b}$$

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[19] Skilled workers prefer skilled to unskilled jobs, since - as shown below - the skilled wage w_s exceeds the unskilled wage w_n.

where $0 \le \rho_i \le 1$, and $\rho_i' > 0$ for $0 < \rho_i < 1$, for i=1,2. Moreover, in line with the analysis of Section III, the proportions of constructive job searchers are

$$\theta_i^* = e^{-1}\left[\rho_i w_i (1-t)(1-\beta)\right], \quad i = s, n \tag{16}$$

Let w_s and w_n be the wage of the skilled and unskilled employees, respectively; and let κ_s and κ_n be the costs of supplying a skilled and unskilled vacancy, respectively. Then the profit from searching for a skilled and unskilled employee is

$$\pi_s = \varepsilon_s\left(\frac{\theta_s^* M_s}{V_s}\right)(a_s - w_s) - \kappa_s, \quad \pi_n = \varepsilon_n\left(\frac{\theta_n^*(L-M_s)}{V_n}\right)(a_n - w_n) - \kappa_n, \tag{17}$$

respectively.

We assume that the wage in each sector is set after a match has taken place; it is the outcome of the following Nash bargain in the skilled and unskilled sectors: $\left(w_i(1-t) - b_i\right)^{\mu}\left(a_i - w_i + f_i\right)^{1-\mu}$, $i = s, n$, where $f_i = \phi_i w_i$. Thus the negotiated wages in these sectors are

$$w_i = \mu\frac{a_i}{1-\phi_i} + \frac{1-\mu}{1-t}b_i, \quad i = s, n \tag{18}$$

We assume, plausibly, that $\phi_s > \phi_n$.

As above, unemployment benefits are taken to be proportional to the wages: $b_s = \beta w_s(1-t)$ and $b_n = \beta w_n(1-t)$. Consequently, the wage determination equations may be expressed as

$$w_i = \alpha\frac{a_i}{1-\phi_i}, \quad i = s, n \tag{18'}$$

where α_i is given by (8b). Observe that since $\phi_s > \phi_n$, it follows that $a_s / a_n > (1-\phi_s)/(1-\phi_n)$, and thus the skilled wage w_s exceeds the unskilled wage w_n.

Substituting the wage equations (18') into the profit equations (17), we obtain

$$\begin{aligned} \pi_s &= \varepsilon_s\left(\frac{\theta_s^* M_s}{V_s}\right)\left(a_s\left(1-\frac{\alpha}{1-\phi_s}\right)\right) - \kappa_s \\ \pi_n &= \varepsilon_n\left(\frac{\theta_n^*(L-M_s)}{V_n}\right)\left(a_n\left(1-\frac{\alpha}{1-\phi_n}\right)\right) - \kappa_n \end{aligned} \tag{17'}$$

Since these profits are driven down to zero under free entry, the degrees of labor market tightness in the skilled and unskilled sectors are

$$\tau_i^* = \left[\varepsilon_i^{-1}\left(\frac{\kappa_i}{a_i\left(1-\alpha/(1-\phi_i)\right)}\right)\right]^{-1}, \quad i = s, n \tag{19}$$

where $\tau_s^* = \theta_s^* V_s / M_s$ and $\tau_n^* = V_n / \theta_n^*(L - M_s)$.

The unemployment rates for the skilled and unskilled workers are

$$u_i = 1 - \theta_i * \rho(\tau_i *), \quad i = s, n \tag{20}$$

In line with the unemployment experience in market economies over the past two decades, we assume that $\tau_s* > \tau_n*$, so that the unemployment rate among skilled workers is less than that among the unskilled. The aggregate unemployment rate is

$$u = \left(1 - \theta_s * \rho_s(\tau_s *)\right)\frac{M_s}{L} + \left(1 - \theta_n * \rho_n(\tau_n *)\right)\frac{L - M_s}{L} \tag{21}$$

At the beginning of the period of analysis - before matching takes place - workers decide whether or not to acquire sufficient human capital to become skilled (and thereby capable of performing skilled jobs). Workers are assumed to be heterogeneous in terms of their costs of human capital acquisition. Ordering the workers in terms of these costs, from lowest to highest, we let the cumulative distribution of the costs be approximated by a continuum given by the function $c(M_s)$, $c' > 0$ for $M_s > 0$. For the marginal worker of a skilled workforce M_s, the expected payoff from human capital acquisition is $\rho_s w_s - c(M_s)$, whereas the expected payoff from remaining unskilled is $\rho_n w_n$. Since the marginal worker is indifferent between acquiring human capital and remaining unskilled, the equilibrium size of the skilled workforce is

$$M_s* = c^{-1}\left[\left(\rho_s(\tau_s *)\alpha\frac{a_s}{1-\phi_s} - \rho_n(\tau_n *)\alpha\frac{a_n}{1-\phi_n}\right)(1-t)\right] \tag{22}$$

taking the wage equation (18') into account. The associated size of the unskilled workforce is of course $M_n* = L - M_s*$.

The government budget constraint now becomes

$$(1-\theta_s * \rho_s)M_s\beta w_s + (1-\theta_n * \rho_n)M_n\beta w_n = tw_s\theta_s * \rho_s M_s + tw_n\theta_n * \rho_n M_n \tag{24}$$

where the left-hand side stands for the government's unemployment benefit payments and the right-hand side is its tax receipts. Substituting equations (16), (18), (19), and (22) into (24), the government budget constraint becomes

$$\begin{aligned}&\left(1-\theta_s * \rho_s(\tau_s *)\right)M_s * \beta\alpha\frac{a_s}{1-\phi_s} + \left(1-\theta_n * \rho_n(\tau_n *)\right)(L - M_s *)\beta\alpha\frac{a_n}{1-\phi_n} \\ &= t\alpha\frac{a_s}{1-\phi_s}\theta_s * \rho_s(\tau_s *)M_s * + t\alpha\frac{a_n}{1-\phi_n}\theta_n * \rho_n(\tau_n *)(L - M_s *)\end{aligned} \tag{24'}$$

The labor market equilibrium is described by equations (16), (19), (21), (22), and (24'). Substituting equations (16), (19), and (22) into (21), we obtain an unemployment equilibrium equation that yields an upward-sloping *UE* curve, as in Figure 4. In the same vein, substituting equations (16), (19), and (22) into (24'), we obtain a government budget constraint that yields an upward-sloping GBC curve, also as in Figure 4.

In the context of this model, we may conceive of training policy directed at the unemployed (e.g. retraining subsidies to unemployed people) as ones that reduce these people's cost of human capital acquisition. Letting c^o be a shift parameter that increases the cost (c) of human capital acquisition, these measures may be seen as reducing c^o. As for

search-promoting measures, we include government spending on training measures in the coefficient β and, for the purposes of the analysis to follow, we assume that their direct contractionary effect on unemployment outweighs their indirect expansionary effect via β.

It is straightforward to show that this training policy is complementary with the policies discussed above, when applied to the skilled sector (e.g. reducing the barriers to job creation in the skilled sector). For instance, job creation policy that reduces κ_s will increase the equilibrium degree of tightness in the skilled labor market (τ_s*) and thereby reduce the equilibrium skilled unemployment rate (u_s*), by equations (19) and (20). This influence magnifies the contractionary effect of the training policy on the unemployment rate, for any given tax rate t, by equation (21). As result, the equilibrium tax rate t* falls which, in turn, further increases the skilled workforce, by equation (22a), which reduces the aggregate unemployment rate even further, and so on. Consequently, the training policy and the job creation policy reinforce one another: $\left(\partial^2 u^* / \partial x^o \partial \kappa_s\right) > 0$.

Along the same lines, it can be shown that the unemployment effect of the training policy is augmented by

- reform of job security legislation: $\left(\partial^2 u^* / \partial x^o \partial \phi_s\right) > 0$,
- search-promoting measures: $\left(\partial^2 u^* / \partial x^o \partial \varepsilon_s^{\,o}\right) > 0$, $\left(\partial^2 u^* / \partial x^o \partial \rho_s^{\,o}\right) > 0$, and $\left(\partial^2 u^* / \partial x^o \partial \varkappa_s^{\,o}\right) > 0$,
- unemployment benefit reform: $\left(\partial^2 u^* / \partial x^o \partial \beta\right) > 0$, and
- policies to reduce the bargaining strength of incumbent employees: $\left(\partial^2 u^* / \partial x^o \partial \mu_s\right) > 0$.

In short, reforms which reduce the costs of human capital acquisition for unemployed people have a smaller effect when implemented in isolation, than in conjunction with the other labor market reforms discussed above.

2. Complementarities with a Legislated Minimum Wage

Now consider the effects of a legislated minimum wage which is binding for the unskilled workers. In other words, letting w_s and w_n be the negotiated wages resulting from the Nash bargaining process, as described by equation (18), and $w^{\min}$ be the legislated minimum wage, we assume that $w_n < w^{\min} < w_s$.

Consequently, while the degree of labor market tightness in the skilled sector remains unchanged from the previous section (as given by equation (19)), in the unskilled sector it now becomes

$$\tau_n^{\min} = \left[\varepsilon_n^{\,-1}\left(\frac{\kappa_n}{a_n - w^{\min}}\right)\right]^{-1} \qquad (19')$$

i.e. on account of the minimum wage, the unskilled labor market is less tight than it would otherwise have been. Thus unskilled unemployment is higher than in the absence of the minimum wage:

$$u_n^{\min} = 1 - \rho\left(\tau_n^{\min}\right) > u_n \tag{20'}$$

and the aggregate unemployment rate is higher as well:

$$u^{\min} = \left(1 - \rho_s(\tau_s{}^*)\right)\frac{M_s}{L} + \left(1 - \rho_n\left(\tau_n^{\min}\right)\right)\frac{L - M_s}{L} > u \tag{21'}$$

The equilibrium skilled workforce under the minimum wage is

$$M_s^{\min} = c^{-1}\left[\left(\rho_s(\tau_s{}^*)\alpha\frac{a_s}{1-\phi_s} - \rho_n\left(\tau_n^{\min}\right)w^{\min}\right)(1-t)\right] \tag{22'}$$

Assuming, as above, that the elasticity of the demand for unskilled labor is less than -1 ($(\partial\rho_n^{\min} / \partial w_n^{\min})(w_n^{\min} / \rho_n^{\min}) < -1$), equation (22') implies that the introduction of the minimum wage reduces the expected income per unskilled worker, thereby raising the skilled-unskilled expected income differential and leading to an increase in the equilibrium size of the skilled workforce.

The government budget constraint in equilibrium is

$$\begin{aligned}&\left(1 - \rho_s(\tau_s{}^*)\right)M_s^{\min}\beta\alpha\frac{a_s}{1-\phi_s} + \left(1 - \rho_n\left(\tau_n^{\min}\right)\right)\left(L - M_s^{\min}\right)\beta\alpha\frac{a_n}{1-\phi_n}\\ &= t^{\min}\alpha\frac{a_s}{1-\phi_s}\rho_s(\tau_s{}^*)M_s^{\min} + t^{\min}\alpha\frac{a_n}{1-\phi_n}\rho_n\left(\tau_n^{\min}\right)\left(L - M_s^{\min}\right)\end{aligned} \tag{24''}$$

where $t^{\min}$ is the tax rate under the minimum wage.

The labor market equilibrium is described by equations (16), (19'), (21'), (22'), and (24").

It is straightforward to show that a fall in the minimum wage reinforces the other unemployment policies above.[20] For instance, job creation measures that reduce κ_s will increase the equilibrium degree of tightness in the skilled sector ($\tau_s{}^*$) and thereby magnify the contractionary effect of a fall in the minimum wage on the unemployment rate, at any given tax rate t, by equation (21'). This complementarity is magnified by the tax effects working through the government budget constraint (24"). Specifically, the introduction of the minimum wage raises the aggregate unemployment rate, reducing the tax base and

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[20] It is important to note that, given our assumption that the labor demand elasticity is less than -1, a fall in the minimum wage unambiguously stimulates employment. This issue is subject to heated debate in the literature (see Card and Krueger, 1995, and Neumark and Wascher, 1995). In our model, a rise in the minimum wage reduces the probability of employment for a given number of constructive searchers, but it increases the number of such searchers. Our elasticity assumption ensures that the former effect on employment dominates the later.

increasing the number of people needing unemployment support; consequently, the equilibrium tax rate rises. The rise in the tax rate reduces the returns to human capital acquisition, thereby leading to a fall in the size of the skilled workforce and a corresponding rise in the unskilled workforce. As equation (21') indicates, this further magnifies the adverse effect of the minimum wage on the unemployment rate. For these reasons, a fall in the minimum wage will have a more powerful effect on unemployment when implemented jointly with job creation measures: $\left(\partial^2 u^* / \partial w^{\min} \partial \kappa_s\right) > 0$.

In the same vein, it can be shown that the unemployment-reducing effect of a fall in the minimum wage is magnified by

- reform of job security legislation: $\left(\partial^2 u^* / \partial w^{\min} \partial f_s\right) > 0$,
- search-promoting measures: $\left(\partial^2 u^* / \partial w^{\min} \partial \varepsilon_s^{\,o}\right) > 0$, $\left(\partial^2 u^* / \partial w^{\min} \partial p_s^{\,o}\right) > 0$, and $\left(\partial^2 u^* / \partial w^{\min} \partial \varepsilon_s^{\,o}\right) > 0$,
- unemployment benefit reform: $\left(\partial^2 u^* / \partial w^{\min} \partial \beta\right) > 0$, and
- policies to reduce the bargaining strength of incumbent employees: $\left(\partial^2 u^* / \partial w^{\min} \partial \mu_s\right) > 0$.

passive income support measures with a negative income tax conditional on employment or job search to achieve distributional objectives with fewer adverse effects on incentives and employment (Snower, 1995b), coupled with a substantial scaling back of existing measures of passive income support; reductions in payroll taxes, particularly for low-wage workers; a liberalization of job security legislation; the reduction of wage rigidities (such as those arising from minimum wages or broad coverage of union wage agreements) to allow wage differentials to better reflect productivity differences; measures to increase incentives for the acquisition and provision of training, including allowing unemployed workers to transfer benefits for training vouchers (Snower, 1995a); longer-run reforms to education systems to better prepare students for the transition to work; and measures to lower search costs by increasing worker mobility, including reforms in the housing market and in the portability of pensions. The foregoing is, of course, only illustrative. Some of the above measures are irrelevant to some countries and, in any case, the relevant range of policy complementarities depends crucially on the countries' institutional structure.

Why are examples of fundamental reform not more common? Although some countries have made progress in improving the functioning of labor markets,[25] the majority of European countries have not carried out packages of "broad" and "deep" reforms. One reason why policy makers have not attempted to implement fundamental labor market reforms may simply be that they have not sufficiently appreciated the importance of complementarities among labor market policies. There are also political economy explanations (Saint-Paul, 1993), although broad based labor market reform may not be as politically difficult as commonly supposed. A coherent reform program that emphasizes the complementarities among different policies, while at the same time addressing distributional concerns more efficiently, could help to generate a constituency in favor of labor market reforms. This might reflect, for example, that fundamental reform might be perceived as more likely to succeed than piecemeal reforms, or it might be less vulnerable to determined opposition from well-organized interest groups if the burden of reform was spread across a wider segment of the population.[26]

Complementarities among policies and institutions are also important in other areas such as trade liberalization and the transition from central planning to a market economy. Although these complementarities have not been formally analyzed, they have been explicitly recognized as important in the design of reform strategies. Piecemeal reforms

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[25] There were far reaching reforms in the United Kingdom in the early 1980s, although (as noted) these did not include major changes to the benefit system or corresponding income support initiatives, or thoroughgoing changes in the public provision of education and training; there is some evidence that these reforms have lowered the long-run equilibrium rate of unemployment. Perhaps the best example of fundamental reform, one that incorporated many of the points highlighted above, is New Zealand (Kasper, 1995). The unemployment rate in New Zealand fell a remarkable 5 percentage points from early 1992 to late 1995, with little evidence of heightened wage pressures.

[26] It is also clear that labor market reforms will be easier to implement in a growing economy.

such as marginal reductions in tariffs without lowering non-tariff barriers, or privatization without ensuring competition and introducing the legal framework of a market economy, for example, are widely recognized as unlikely to be effective. As with labor market reform, these are also areas where political economy issues are important. Governments have had the most success in trade liberalization and in the transition process where they have fostered a constituency for fundamental reform across a broad range of policies. The same is likely to be true in the area of labor market reforms.

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