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**ANATOMY OF POLICY
COMPLEMENTARITIES**

BY J. MICHAEL ORSZAG AND DENNIS J. SNOWER

Anatomy of Policy Complementarities

Mike Orszag and Dennis J. Snower *

Over the past 25 years, unemployment policy in many European countries has not been a resounding success. Policy makers differ on why this has been so. Some contend that the problem is due to policy ineffectiveness, viz., it is alleged that the available policy instruments have little influence on unemployment. Others believe that unemployment policies are pointless, since they merely replace the unemployment problem by an inequality problem. And yet others believe that the underlying problem is one of policy inactivity, viz., the policy initiatives have been too few and too timid.

All these influential theses, we claim, are myths. We will argue, instead, that European unemployment policies have frequently been unsuccessful because governments have generally failed to exploit economic and political complementarities among policy measures. *Economic complementarities* exist when the effectiveness of one policy depends on the implementation of other policies, and *political complementarities* arise when the ability to gain political consent for one policy depends on the implementation of other policies.

* We are deeply indebted to Lars Calmfors, Bertil Holmlund and Assar Lindbeck for their insightful comments.

This paper examines the causes and consequences of these complementarities, investigates the interplay among them, and analyzes how unemployment policies are to be formulated in this context.

There is some economic literature relevant to these concerns. Coe and Snower (1997) identify various sources of economic complementarities.¹ Striking empirical evidence of economic complementarities has emerged in a number of recent studies.² There are some articles on why a particular political process may yield labor market policies associated with excessive unemployment (e.g. Saint-Paul (1993)). Thus far, however, no attention has been given to how political policy complementarities arise alongside the economic ones, and what this network of complementarities implies for policy making. These important gaps are the subject of this paper.

The paper is organized as follows. Section 1 discusses the three myths about unemployment policy making and how our analysis of complementarities debunks them. Section 2 constructs a simple framework for thinking about economic and political complementarities. Section 3 examines how to make policy decisions in the presence of these complementarities. And finally Section 4 examines how political constraints on to policy change can be overcome through broad-based reform pack-

¹ Coe and Snower (1997) examine economic complementarities in a static context. However, the dynamic aspect of the reforms turns out to be particularly significant for, as we shall see, the appropriate policy strategy depends heavily on such dynamic factors as people's rate of time discount and their degree of risk aversion regarding their consumption and work through time. Moreover, due to the existence of labor turnover costs (such as costs of hiring, training, and firing), employed people generally have far greater chances of keeping their jobs than unemployed people have of acquiring them. Consequently, a policy that helps move people from unemployment into employment during one time period will influence the unemployment rate in subsequent time periods. This means that the long-term effects of complementary policies may be substantially larger than their impact effects. This paper attempts to quantify these long-term effects for some plausible economic scenarios.

² See Buti, Pench, and Sestito (1998), Daveri and Tabellini (1997), and Elmeskov, Martin and Scarpetta (1998).

ages that take advantage of the existing economic and political complementarities among the individual policy measures.

1. The Three Myths

Over the past two decades European unemployment policy has been conducted in the shadow of three powerful - although partially contradictory - myths.

1.1 The Policy Ineffectiveness Myth

The policy ineffectiveness myth is a dangerous one, since it diverts policy makers from focusing on measures to create employment and implies that their main objective should be spreading the burden of unemployment more equally across the working-age population, primarily through working time reductions and early retirement schemes. The dangers of this policy approach are well known.³ But beyond that, our analysis suggests that - despite the continued high levels of European unemployment in the face of numerous attempts at policy reform - the available unemployment policies may well *not* be inherently ineffective. The reason is that past reforms have often failed to exploit economic complementarities.

It is easy to see how such complementarities may arise. For example, since it is impossible for people to find more work when firms don't provide new jobs, and since it is impossible for firms to fill their vacancies when there is no one looking for them, supply-side labor market policies (e.g. job search-promoting measures such as job counseling) are complementary with demand-side policies (such as measures to stimulate investment demand). Furthermore, tax breaks for hiring the long-term unemployed (such as those in France or Germany) may be ineffective in the presence of generous unemployment benefits, since the benefits will discourage the unemployed from taking advantage of the tax breaks. Giving employers greater latitude in negotiating fixed-term contracts (as in Spain) may do little to stimulate employment unless

³ It has proved very difficult to implement worksharing and early retirement without raising non-wage labor costs (particularly costs of hiring and training) and thereby discouraging firms from creating more jobs. Furthermore, by diminishing the number of people competing for jobs, these measures may put upward pressure on wages and thereby on prices. Monetary and fiscal authorities may then feel called upon to dampen inflation through contractionary policies, thus generating further unemployment.

the job security provisions associated with the incumbent employees are relaxed (e.g. see Bentolila and Dolado (1994)). Reducing the magnitude and duration of unemployment benefits may have only a limited effect on the employment rate in the presence of large incapacity benefits (as in the Netherlands) or high minimum wages (as in France).

In the presence of economic complementarities, individual unemployment policy measures might look ineffective - but only when the overall package of policies is insufficiently "broad," i.e. when the package covers an insufficiently wide range of policies within a set of economically complementary ones.

1.2 The Unemployment-Inequality Myth

According to the unemployment-inequality myth, governments must choose between two disagreeable options: a "flexible" labor market bedeviled by wide income disparities and an "inflexible" labor market crippled by unemployment. The "flexible" market, where people's wages reflect their productivities, is allegedly achieved by reducing job security, restricting unemployment benefits and welfare entitlements, eliminating minimum wages, and bashing the unions. The "inflexible" market, where people's earnings reflect politicians' judgments about fairness and social cohesion, is supposedly achieved by the opposite policies. The ultimate choice, then, is between unemployment and inequality.

We argue that the unemployment-inequality trade-off should not be regarded as an exogenous constraint on policy making. On the contrary, it is commonly the *outcome* of unenlightened policies. The system of unemployment benefits taxes financed through general taxes is a good example. When unemployed people find jobs, their unemployment benefits are withdrawn and taxes are imposed on both them and their

employers. Consequently, this policy discourages the unemployed from seeking work. Within this system, reducing unemployment benefits would reduce unemployment, but only by making the unemployed worse off relative to the employed. What usually gets overlooked is that this unemployment-inequality trade-off is the *outcome* of the policy under consideration, which makes it impossible to compensate the unemployed for a decline in benefits. A “broader” set of complementary policies would permit such compensation.

Our analysis suggests that by distributing the incentives to work more equally across the working population, it may be possible to reduce *both* unemployment *and* inequality. Economically complementary policies have an important role to play in shifting the unemployment-inequality trade-off. “Narrow” packages of reforms – defined as packages that do not exploit the existing economic complementarities – are generally associated with unnecessarily unfavorable trade-offs between unemployment and inequality; whereas “broader” packages could relax these disagreeable trade-offs.

1.3 The Inactivity Myth

And finally, the *inactivity myth* is false, since most European countries have been far from inactive on unemployment policy over the 1980s and 1990s. Examples abound.

France, whose unemployment continues to hover around 12 percent, has implemented in a wealth of measures to promote employment and stimulate job search, including reductions in employers’ social security contributions, subsidies for young workers and the long-term unemployed, training programs and more flexible working time arrangements. In addition, the French unemployment benefit system has

been reformed to reduce the duration of unemployment benefits and to permit the size of the benefits to fall with their duration.

Spain, with an unemployment rate that remains stubbornly above 20 percent, has undertaken an impressive variety of initiatives over the past one and a half decades. In 1984 it introduced fixed-term contracts with low associated severance pay. In the early 1990s the Spanish government reduced the magnitude and duration of unemployment benefits and raised the minimum employment period that creates entitlement to benefits. Since then regulations limiting labor mobility have been dismantled, the monopoly of the state employment agency has been ended, and firms have been given opportunities to opt out of some aspects of sectoral wage agreements. In addition, the government has introduced apprenticeship wage contracts associated with remuneration below the minimum wage and low non-wage labor costs.

Italy, whose unemployment is still stuck at 12 percent, has also conducted a long list of supply-side reforms over the 1990s. Wage indexation (the *scala mobile*) has been abolished and a new wage bargaining framework has been introduced that links wages at the national level to projected inflation. Hiring regulations have been liberalized and job search programs have been instituted.

Belgium, with an unemployment rate of 12.5 percent, has tightened unemployment insurance eligibility requirements for the long-term unemployed, as well as for temporary and part-time workers. Wage indexation has been watered down; tax exemptions have been granted for the hiring of young workers; and training programs for the long-term unemployed have been introduced.

Despite this record, the inactivity myth is not entirely off the mark. Although most European countries have witnessed many reforms, these reforms have often

been implemented in a partial, piecemeal, timid fashion. With two notable exceptions - the Netherlands and the UK - policy changes have typically been introduced one at a time, each rationalized on a stand-alone basis rather than as part of a self-reinforcing package of complementary policies; and many of the changes - such as the magnitude and duration of unemployment benefits - have often been modest and incremental. If many existing policies are economically undesirable - that is, if they are both inefficient and inequitable - why wasn't more comprehensive reform undertaken? This question is a political, rather than an economic one. What is it about the democratic political process that has kept many European governments from implementing bolder, more enlightened reforms?

To shed light on this important issue, we argue that unemployment policies are characterized by *political complementarities*. For example, as our analysis indicates, the political feasibility of unemployment benefit reform (such as reducing the magnitude and duration of unemployment benefits) depends on tax reform (such as reducing payroll and income taxes) and employment promotion policies (such as hiring subsidies). The reason, we will argue, is that "single-handed reforms" (e.g. reducing unemployment benefits without changing any other policy instrument) - even though they may improve economic efficiency - often pit the interests of the employed against those of the unemployed, creating political deadlock. "Broad (many-handed) reforms," by contrast, enable the government to use the efficiency gains from one reform to compensate the losers from another reform, and vice versa, thereby breaking the political deadlock.

In the presence of political complementarities, it is not surprising that governments should find it politically impossible to implement bolder policy reforms – provided that the portfolio of reforms under consideration is too narrow.

1.4 Debunking the Myths

In sum, the upshot of our analysis is that Europe’s cardinal policy mistake has been to focus on an excessively narrow set of policies, in the sense that the appropriate labor market reforms have generally not been formulated conjointly to exploit a network of self-reinforcing economic and political complementarities.

Economic complementarities reinforce the political ones, and vice versa. In particular, the greater are the economic complementarities, the greater is the payoff from broad reforms, and the greater is the government’s latitude to break political deadlock through such reforms. Conversely, the easier it is to break political deadlock through broad reforms, the more latitude the government has to exploit economic complementarities among the individual reform measures.

The combination of economic and political complementarities makes a strong case for broad-based reform. In the presence of such complementarities, policy makers do not have a choice between “broad” reform (using many policy instruments in conjunction with one another) and “deep” reform (using an individual policy instrument intensively). The reason is that “deep” reform is generally associated with unfavorable unemployment-inequality trade-offs, so that less unemployment can be achieved only making some people significantly better off at the expense of making others significantly worse off. Such a course tends to be politically unacceptable.

We argue that the deficient “breadth” of much European labor market reform over the past two decades has made it politically infeasible to do more than small, incre-

mental, piecemeal adjustments of prevailing policy packages. In this way the deficient “breadth” of reform packages has been responsible for their deficient “depth,” as evidenced by the small changes in replacement ratios, duration of unemployment benefits, or severance pay requirements in many European countries.

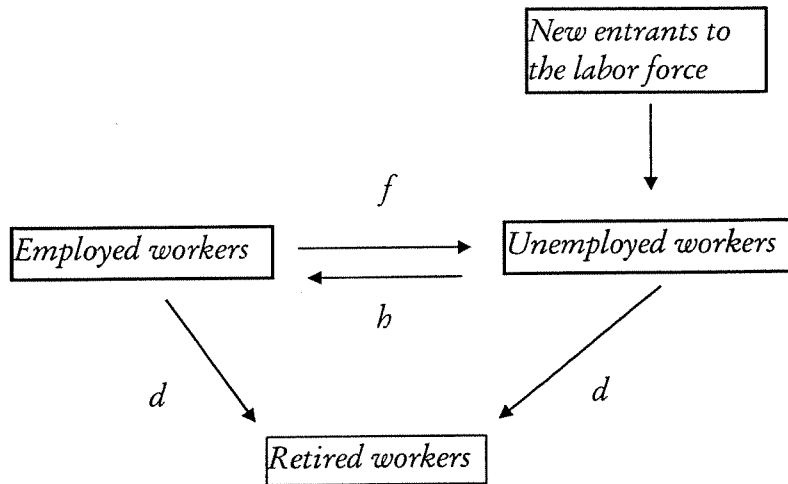
For labor market reform to become politically feasible, the unpleasant unemployment-inequality trade-offs need to be relaxed, and that becomes achievable through “broad” reform. “Broad” reform strategies are not just more effective on account of economic complementarities, but may also permit the implementation of “deep” reforms through the exploitation of political complementarities.

2. A Simple Framework for Thinking about Policy Complementarities

In order to formulate strategies for broad-based policy reform, we first need a framework for thinking about policy complementarities. To keep the framework simple and transparent, we strip labor market activity down to bare essentials.

Consider a labor market in which workers are either employed or unemployed. Each employee has a chance f of becoming fired (and joining the unemployment pool), and each unemployed person has a chance h of being hired (and joining the ranks of the employees). Moreover, the employed and unemployed workers die at rate d , and new workers enter the labor force so that the overall labor supply remains constant through time. These transitions between employment and unemployment, and into and out of the labor force, may be illustrated as follows:

Figure 1. Labor Market Flows



Each employed worker receives an income that consists of the wage (w), paid by his employer, minus a tax, which could be interpreted as an income tax or payroll tax. Let t be the tax rate, so that the employee's income is $w(1-t)$. Moreover, each unemployed worker receives an unemployment benefit (b).

Table 1. Incomes

Employed Worker	Unemployed Worker
Wage Income: $w(1-t)$	Unemployment Benefit: b

We can learn a lot about economic and political complementarities by focusing on the interrelations between the effects on unemployment benefit reform (viz. reducing b) and tax reform (viz. reducing t). To begin with, let us examine how these policies affect the incentives of the employed and unemployed workers.

2.1 Incentives to Work and Seek Work

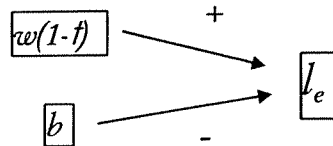
Since policy complementarities arise when different policy measures have complementary effects on people's incentives, let us focus on employees' incentives to work and unemployed people's incentives to seek work. An employee's work effort may be portrayed in terms of how he divides his time between work and leisure while on the job. In each period, the employee decides to spend an amount of time, l_e , on leisure (where the subscript e stands for "employee") and the remainder on work.

Moreover, the less effort the employee devotes to his job (i.e. the more leisure l_e that the employee takes on the job), the greater are his chances of getting fired.⁴ Thus the employee faces an intertemporal trade-off. He enjoys leisure, but taking this leisure now raises his chances of losing his job in the future, thereby experiencing a drop in income. The greater the differential between the employee's income and the unemployment benefit, the greater the cost of losing a job, and consequently the harder the employee will work (i.e. the less leisure he will take).

⁴ There are many possible reasons for this phenomenon. For example, the employer may find it worthwhile to promote work incentives by undertaking to fire an employee if his productivity falls beneath a specified minimum level. The employee's productivity, furthermore, may depend on the amount of time he devotes to work, as well as on some random factors (accidents, diseases). Consequently, the more leisure the employee takes on the job, the lower his chance of exceeding the minimum acceptable productivity level and thus the greater his chances of being fired.

Figure 2. Influencing Work Effort

The greater is wage income ($w(1-t)$) relative to the unemployment benefit (b), the greater is the employee's work effort:

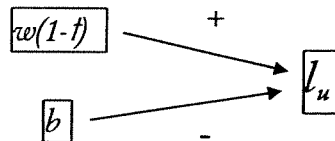


Along similar lines, an unemployed person's effort in seeking work may be depicted in terms of how much time he spends looking for a job. In each period, the unemployed person spends a fraction of time, l_u , on leisure (where the subscript u stands for "unemployed") and the remainder on job search.

The less effort the unemployed person devotes to job search (i.e., the more leisure l_u the unemployed person consumes), the lower are his chances of finding a job and thus the lower his chances of getting hired. This person also faces an intertemporal trade-off. The more leisure he takes, the better off he is now, but the worse off he will be in the future, for the smaller will be his chances of experiencing a rise in income. The greater the differential between the wage income and the unemployment benefit, the greater the benefit of finding a job, and consequently the harder the unemployed worker will search.

Figure 3. Influencing Search Effort

The greater is wage income ($w(1-t)$) relative to the unemployment benefit (b), the greater is the unemployed person's search effort:



In short, unemployment benefit reform (reducing b) and tax reform (viz. reducing t) stimulate the incentives to work and seek work, since they both widen the differential between the incomes received by employed and unemployed people.

2.2 Incentives to Hire and Fire

The firms make the employment decisions, viz. they determine the hiring rate (the chances that an unemployed worker is given a job) for any given level of search effort (lower l_u) by the unemployed. The firms also determine how the firing rate (the chances that an employed person loses a job) responds to work effort (lower l_e). These decisions are made so as to maximize their firm's profits.

Like the workers, the firms also face trade-offs. With regard to hiring, firms face hiring costs (that rise with the hiring rate) and benefits in the form of revenue. Besides, the greater is the hiring rate (for any given search effort), the greater is the benefit from finding a job, and thus the greater is the unemployed people's search incentive and the easier and cheaper it is for the firms to find the job applicants.

With regard to firing, firms face explicit firing costs as well as effort-related costs: the greater is the firing rate (for any given work effort), the smaller is the gain from keeping a job (since the job is likely to be terminate before long), and thus the smaller will be employees' work effort. The firm also has benefits from firing: The more responsive is the firing rate to work effort, the greater will be the work incentive.

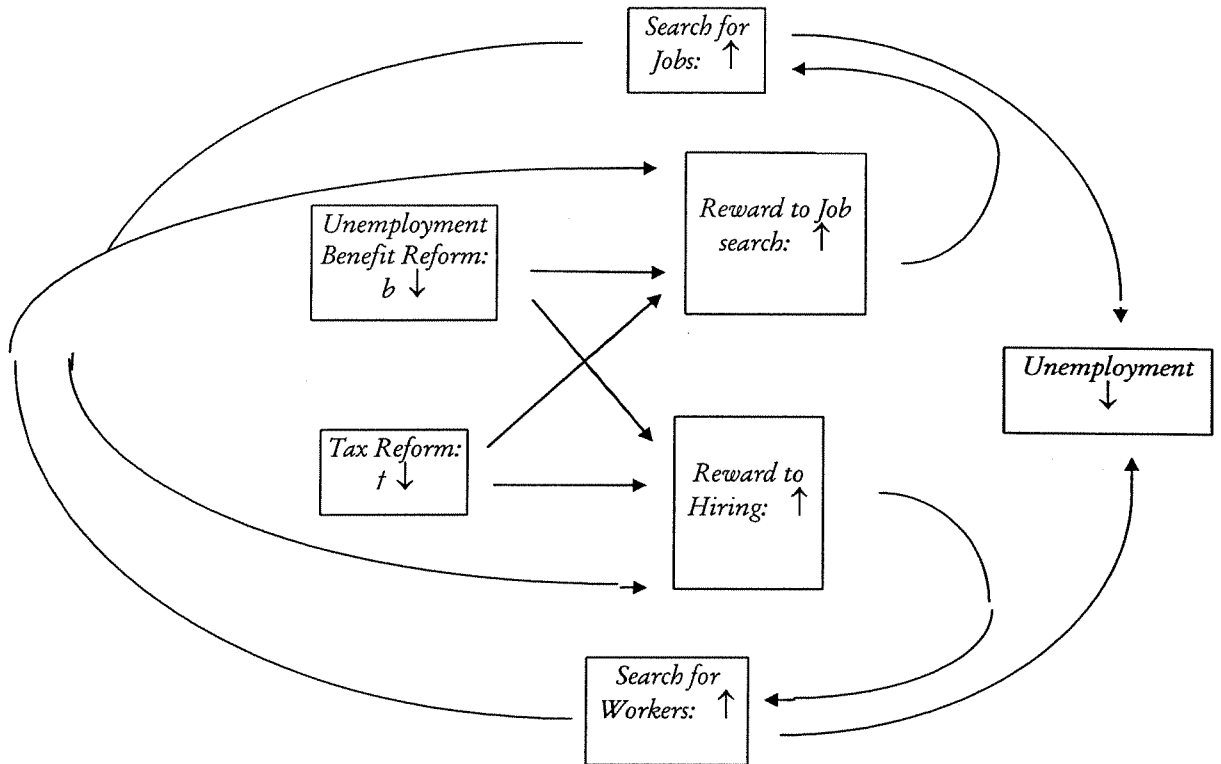
2.3 Sources of Economic Complementarities

In this context, it is easy to see how economic complementarities can arise. The following are various major sources.

First, the most basic complementarity between unemployment benefits and taxes arises because the firms' search for workers reinforces the workers' search for jobs, and vice versa. It is no use to give the unemployed incentives to seek jobs (say, by reducing their unemployment benefits) if firms lack the incentives to hire them (say, because payroll taxes are too high); and conversely, it is no use to give the firms incentives to create new jobs if workers lack the incentives to seek them. In this way, unemployment benefit reform (promoting search for jobs) is complementary to tax reform (promoting search for employees).

The economic linkages responsible for this complementarity are pictured in Figure 4.

Figure 4. Economic Complementarities Operating through the Interaction between the Search for Jobs and the Search for Workers



Here the economic complementarities may be identified through the following causal relations:

- Unemployment benefit reform (a fall in b) and tax reform (a fall in t) both raise the workers' reward to searching for jobs and the firms' reward to hiring (as shown by the arrows from b and t to the "reward to job search" and the "reward to hiring" boxes).
- The rise in the reward to job search stimulates the amount of search the workers do and this, in turn, increases the reward from hiring. For the harder the workers search for jobs, the cheaper it is for employers to hire them (as indicated by the ar-

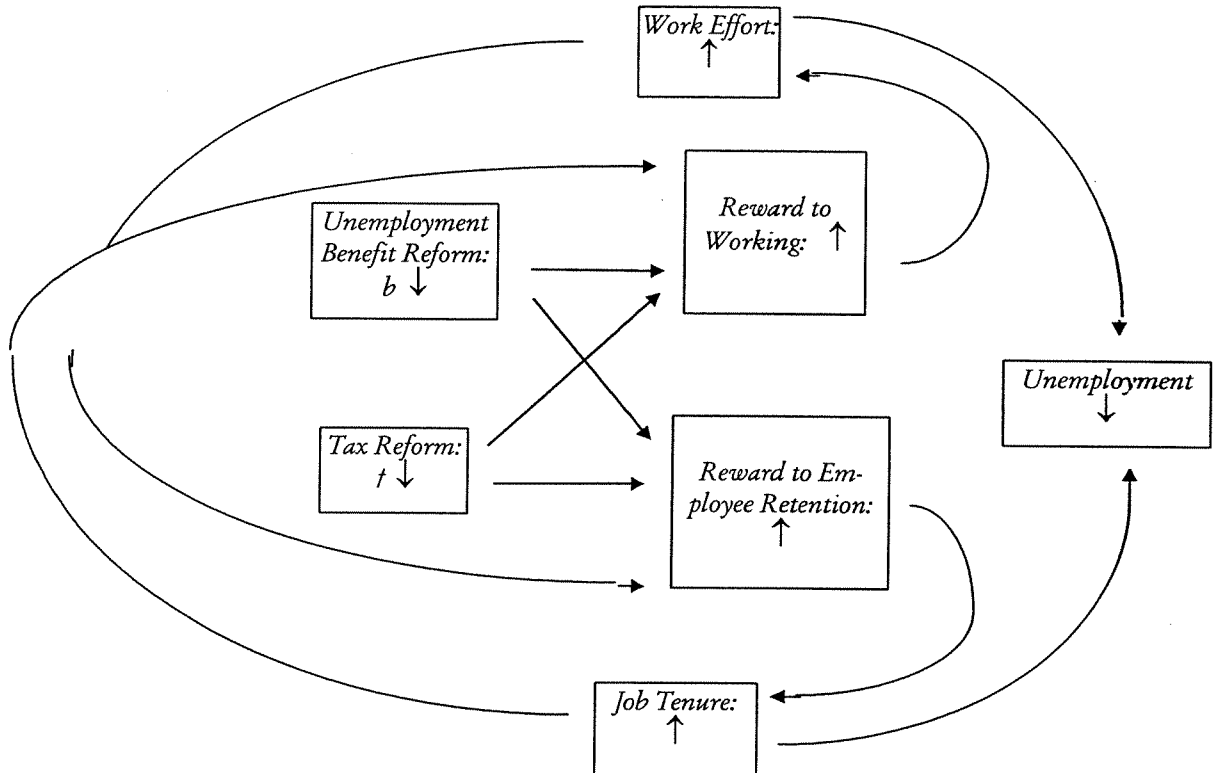
rows from the “reward to job search” to the “search for jobs” to the “reward to hiring” boxes).

- Furthermore, the rise in the reward to hiring stimulates the amount of employers’ search which, in turn, raises the reward to searching. For the harder the employers search for workers, the more likely will workers’ search be successful (as shown by the arrows from the “reward to hiring” to the “search for workers” to the “reward to searching” boxes).
- Thus the influence of a fall in unemployment benefits on the search for jobs augments the influence of a fall in taxes on the search for workers, and vice versa.

Second, a complementarity between unemployment benefit reform and tax reform arises because employees’ work effort reinforces employers’ retention decisions, and vice versa. There is little point to give employees incentives to work hard (say, by reducing unemployment benefits) if firms have no intention of retaining them; and on the other side, there is little point to give firms incentives to retain their employees if these employees lack the incentives to work.

The relevant causal relations are illustrated in the following figure:

Figure 5. Economic Complementarities Operating through the Interaction between Work Effort and the Employee Retention



Now the economic complementarities work themselves out through the following channels:

- Unemployment benefit reform and taxes reform both raise the workers' reward to work effort and the firms' reward to retaining their employees (as shown by the arrows from b and t to the "reward to working" and the "reward to employee retention" boxes).
- The rise in the reward to working stimulates the employees' work effort and this, in turn, raises the firms' the reward from retention. For the harder the employees work, the more worthwhile it is for the firms to retain these employees (as indi-

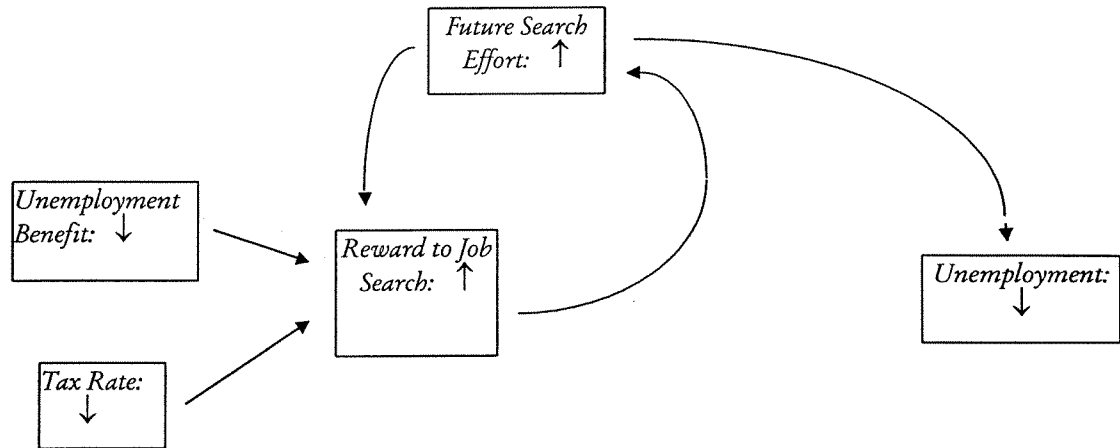
cated by the arrows from the “reward to working” to the “work effort” to the “reward to employee retention” boxes).

- Furthermore, the increase in the reward to employee retention raises the length of employees’ job tenure which, in turn, stimulates the reward to working. For the longer employees can expect to remain employed, the larger is their reward for their work effort (as shown by the arrows from the “reward to employee retention” to “job tenure” to the “reward to working” boxes).
- Thus the influence of a fall in unemployment benefits on work effort augments the influence of a fall in taxes on job tenure, and vice versa.

Third, there is an intertemporal complementarity operating through search effort. In the current time period, unemployment benefit reform stimulates the reward to job search and thereby raises current search effort. The increase in current search effort, in turn, raises the chances of finding a job in the future and thereby stimulates future search effort. By how much future search effort will be stimulated depends on the tax burden. In this way, unemployment benefit gives more leverage to the influence of tax reform on search effort.

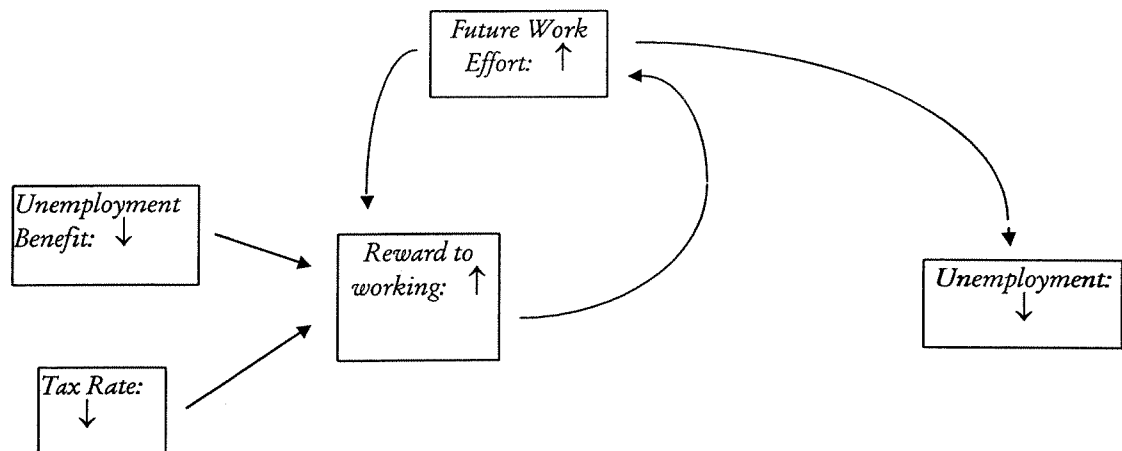
This intertemporal complementarity also works the other way round: Tax reform stimulates search effort, which increases the chances of finding a job in the future, and the resulting stimulus to future search effort depends on the level of unemployment benefits. So tax reform also gives more leverage to unemployment benefit reform.

Figure 6. Intertemporal Complementarities Operating through Search Effort



And *fourth*, there is an intertemporal complementarity operating through work effort. In the current time period, tax reform stimulates the reward to working and thereby raises current work effort. The increase in current work effort, in turn, raises the employees' chances of keeping their jobs in future and thereby stimulates future work effort. By how much future work effort will be stimulated depends on the level of unemployment benefits (which is the alternative to wage income). In this way, tax reform augments the influence of unemployment benefit reform on work effort. Conversely, a drop in unemployment benefits stimulates work effort, which increases the employees' chances of keeping their jobs in the future, and the resulting stimulus to future work effort depends on the tax burden. So unemployment benefit reform also augments the unemployment effects of tax reform.

Figure 7. Intertemporal Complementarities Operating through Work Effort



Although there are further sources of complementarities in our model, the ones above are sufficient to illustrate some salient channels whereby unemployment benefit reform and tax reform have complementary effects on unemployment.

2.4 Assessing Economic Complementarities

The total degree of the economic complementarities between unemployment benefit reform and tax reform may be measured by a statistic called the “cross elasticity of unemployment with respect to the unemployment benefit and the tax”. This measure indicates how much the responsiveness of unemployment to the unemployment benefit is influenced by the tax.⁵

The following table provides computations of these cross elasticities for various levels of the unemployment benefit and the tax rate. These computations are based on

⁵ Specifically, the responsiveness of unemployment to the unemployment benefit is computed as the percentage change in the unemployment rate resulting from a percentage change in the unemployment benefit. Then the cross elasticity is the percentage change in the above responsiveness resulting from a percentage change in the tax.

plausible parameter values for our model, built on the analytical framework described above (and specified in the appendix).

Table 2. The Effects of Alternative Tax-Benefit Policy Combinations

[Insert Table 2 here]

The first row of the table describes the baseline position of our model economy. The welfare effects of alternative tax-benefit policy combinations are evaluated relative to this baseline. In the first column, b is given in terms of the replacement ratio (the ratio of unemployment benefits to the wage). The fourth and fifth columns specify the elasticity of unemployment with respect to the replacement ratio (η_b) and with respect to the tax rate (η_τ). The cross-elasticities are given in the third column. For example, in the second row, a cross elasticity of 0.04, associated with an elasticity of unemployment with respect to the tax rate of 0.6, means that a 10 percent fall in the replacement ratio would raise the responsiveness of unemployment to lower taxes by approximately 66 percent. In the last row, a cross elasticity of 0.35, associated with an elasticity of unemployment with respect to the tax rate of 0.277, means that a 10 percent fall in the replacement ratio would increase the unemployment responsiveness to lower taxes by 79 percent.

These economic complementarities are brought into sharp relief in Figure 6, which plots the cross-elasticities corresponding to a wide range of tax and benefit values.

b	τ	cross-elasticity	η_b	η_r	Government Budget	Aggregate welfare	Welfare of employees	Welfare of unemployed
0.40	0.08	0.13	1.53	0.13	Balanced	118.8	118.9	116.8
0.30	0.06	0.04	0.83	0.06	Deficit	↑	↑	↓
0.32	0.07	0.06	1.04	0.79	Balanced	↑	↑	↓
0.36	0.075	0.09	1.26	0.103	Balanced	↑	↑	↓
0.415	0.0825	0.14	1.61	0.145	Balanced	↓	↓	↑
0.495	0.099	0.35	2.51	0.277	Balanced	↓	↓	↓

Note: Baseline parameter values are reviewed in the Appendix.

Table 2: The Effects of Alternative Tax-Benefit Policy Combinations.

Figure 8. Economic Complementarities

[Insert figure on “Economic Complementarities” here]

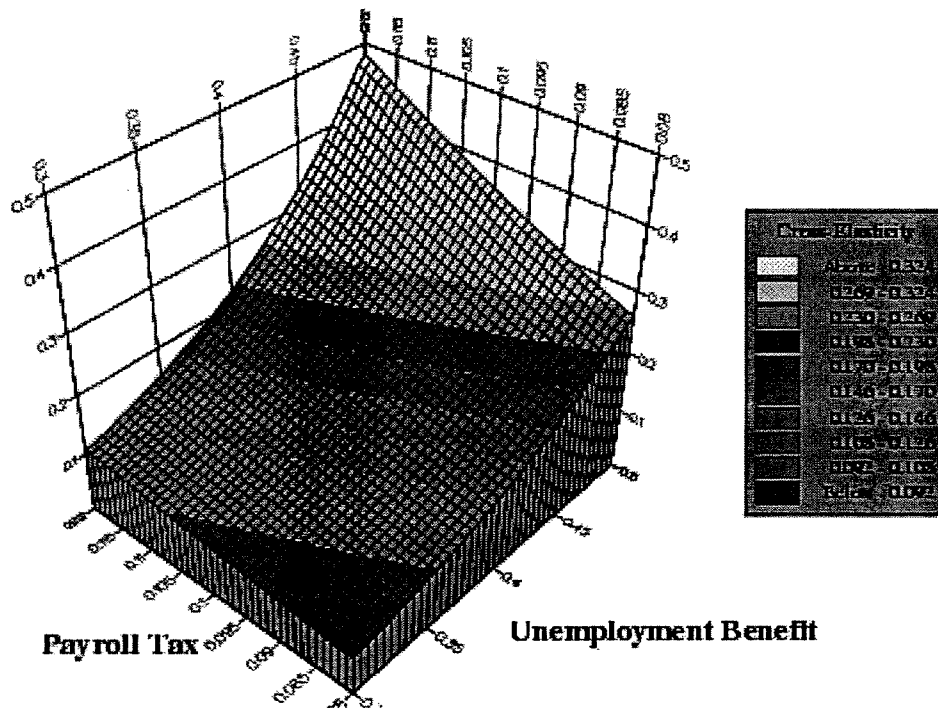
The previous table and figure conveys a strong message. First, all the cross elasticities are positive, which means that the unemployment reducing effect of benefit reform (a fall in b) is always augmented through tax reform (a fall in τ). Second, the cross elasticities rise as the unemployment benefit and the tax rate rise. This means that the higher the unemployment benefit and the tax rate, the more benefit reform and tax reform reinforce one another with respect to unemployment. In short, the gains from exploiting the economic complementarities are greatest when taxes and transfers are highest.

The upshot of these economic complementarities is illustrated in the following figure, which shows how the unemployment rate depends on the unemployment benefit and the tax.

Figure 9. Unemployment, Taxes, and Transfers

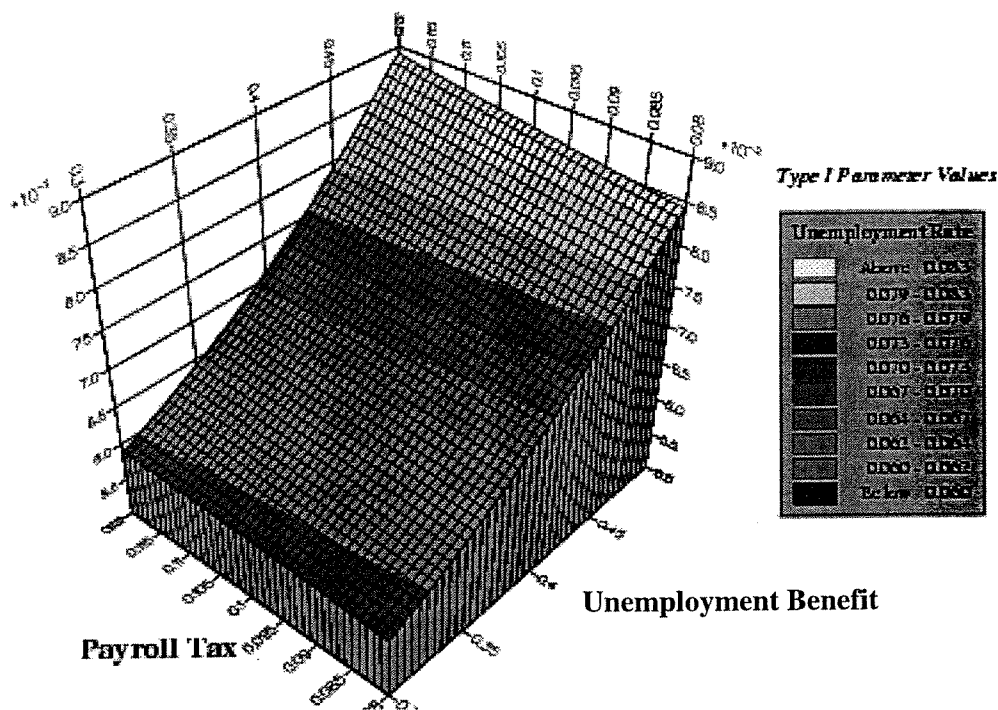
[Insert figure on “Unemployment, Taxes, and Transfers” here]

Observe that the unemployment rate not only rises with the benefit and the tax; it rises particularly fast when the benefit and the tax are increased together.



Note: the unemployment benefit is specified in terms of the replacement ratio (i.e., the ratio of the unemployment benefit to the average wage).

Figure 8: Economic Complementarities



Note: the unemployment benefit is specified in terms of the replacement ratio (i.e., the ratio of the unemployment benefit to the average wage).

FIGURE 9: Unemployment, Taxes and Transfers

3. Policy Decision Making in the Presence of Complementarities

The existence of economic complementarities indicates that there may be a payoff to setting different policy instruments conjointly, but it offers little guidance on how to do so. The reason is that we have said nothing so far about whether the government is able to finance the complementary policies above (for instance, not all the policies in Table 1 leave the government's budget in balance). Furthermore, we have not considered whether the policies are politically feasible (for example, none of the policies in Table 1 make both the employed and unemployed people better off, and thus political consensus in favor of these policies may be difficult to achieve). In order to understand how different policy measures can be used in conjunction with one another to achieve a socially desirable unemployment rate, it is necessary to take account of the budgetary and political constraints that governments face. This section provides a simple framework of thought for these issues.

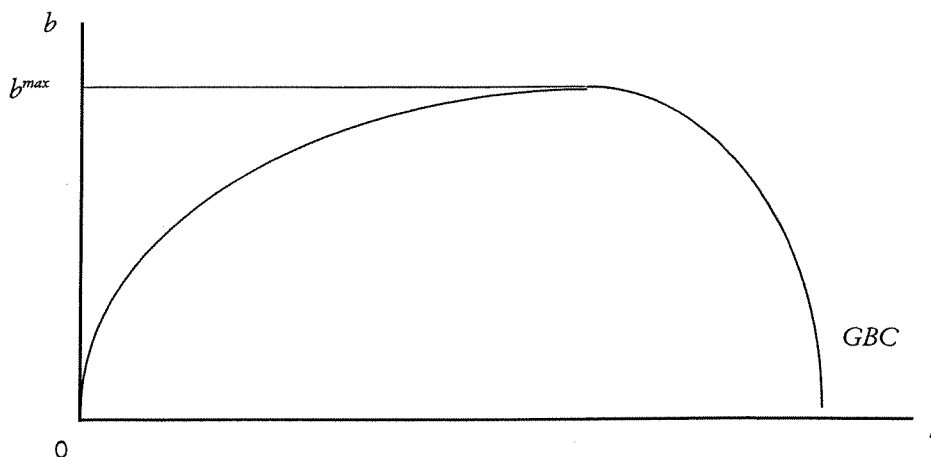
We construct the framework in a sequence of steps. First we examine the government budget constraint, which describes what combinations of benefits and taxes the government can afford. Second, we describe the status quo of the labor market, i.e. the initial position that the government seeks to improve. Third, we specify the aim of government policy, i.e. its objective in terms of unemployment and inequality. And fourth we show why this aim may be impossible to achieve on account of political constraints.

The scenario⁶ we examine may be termed the “Franco-German nightmare” (where France and Germany are perhaps the most prominent, by no means the only, European countries to have exhibited these economic symptoms): Unemployment is undesirably high, as are unemployment benefits and taxes, but the government finds it politically infeasible to do anything about this problem. Later, in Section 4, we will show the problem can be mitigated through the implementation of a “broader” policy strategy.

3.1 The Government Budget Constraint

To capture the government’s budgetary restrictions in a transparent way, let us suppose that the money spent on unemployment benefits must be raised through taxes. The following figure depicts the government budget constraint (GBC) in the context of the labor market described above.

Figure 10. The Government Budget Constraint



⁶ This scenario is generated by the plausible parameter estimates described in the appendix. Of course, different estimates are able to generate different scenarios (as defined by the relative shapes and positions of the government budget constraint and the indifference curves of the employed and unem-

Clearly, when the government makes no transfers, it needs to raise no taxes: so when the unemployment benefit $b = 0$, then the tax rate $t = 0$ as well. Thus the government budget constraint goes through the origin of the figure.

As the unemployment benefit is gradually raised above zero, two things happen. First, unemployment rises, and therefore the government's transfers (bU , the unemployment benefit times the number of unemployed people) rise faster than the unemployment benefit. Second, employment falls, and thus the tax base declines (there are fewer employed people to pay the tax), and therefore a given tax rate generates a smaller amount of tax revenue (tN , the tax rate times the number of employed people taxed). For both of these reasons, equal incremental increases in the unemployment benefit b require larger and larger incremental increases in the tax rate t . This phenomenon is amplified by the fact that the increases in the tax rate also raise unemployment and reduce employment (by reducing the reward to work), further raising transfer payment and further eroding the tax base. Consequently, in the figure the government budget constraint becomes progressively flatter as the unemployment benefit b rises.

Eventually, the unemployment benefit reaches a maximum, b^{max} in the figure. Beyond that, further increases in the tax rate (t) reduce the tax base (N) by so much that tax revenues (tN) can no longer fund transfers at the rate of b^{max} per head. Thus, the unemployment benefit declines. This is the well-known "Laffer effect," pictured by the downward-sloping portion of the government budget constraint in the figure.

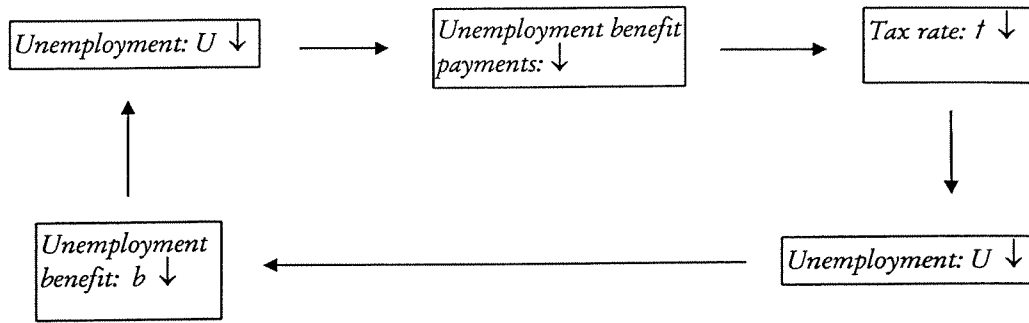
employed people, described below). We have decided to concentrate on the scenario above since it appears to typify an important problem of policy decision making in Europe.

Along the upward-sloping portion of the government budget constraint, unemployment benefit reform reinforces tax reform and vice versa. Specifically, a fall in unemployment, initiated through these reforms, leads to a chain reaction of declines in unemployment benefits and taxes:

- The lower the level of unemployment, the less money the government spends on unemployment benefits (bU , that is, per capita unemployment benefits times the unemployment level).
- The less the government spends on unemployment benefits, the lower the tax rate necessary to finance the government's unemployment benefit bill.
- The lower the tax rate, the better off are the employed workers, and the lower the per capita unemployment benefit that is needed to keep the unemployed workers just as well off as they were before. (The reason is that the unemployed workers have a chance of becoming employed and thus being better off than previously.)
- The lower the per capita unemployment benefit, the lower will be the corresponding unemployment level.
- Thus the less the government spends on unemployment benefits, permitting a further drop in the tax rate, and so on.

Needless to say, these successive declines in unemployment benefits and the tax - which may be called the "government budget multiplier - will have a larger effect on unemployment, the greater are the economic complementarities between these policies.

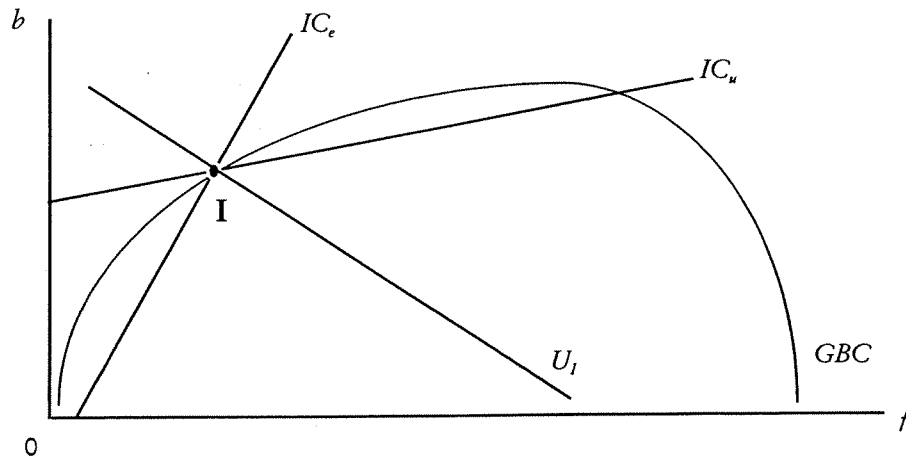
Figure 11. The Government Budget Multiplier



3.2 The Status Quo of the Labor Market

The status quo position of the labor market may be represented by a point on the government budget constraint, such as point *I* in the following figure (where *I* stands for “initial” position).

Figure 12. The Status Quo Position



The welfare of the unemployed people at the status quo point may be illustrated by the indifference curve IC_u going through point *I*. This indifference curve is the set

of points along which the unemployed people are equally well off.⁷ Observe that this indifference curve is upward-sloping: An increase in the unemployment benefit b makes the unemployed people better off and an increase in the tax t makes them worse off (since it reduces their income once they become employed). Thus a rise in the unemployment benefit must be offset by a rise in t so that the unemployed remain equally well off along the indifference curve.

The welfare of the employed people at point I may be illustrated by the indifference curve IC_e , going through point I . This indifference curve, which is the set of points along which the employed people are equally well off, is also upward sloping. A rise in the tax t makes the employed people worse off (since it reduces their income), while a rise in the unemployment benefit b makes them better off (since it increases their purchasing power when they become unemployed). Thus a rise in the benefit must be counteracted by a rise in the tax in order for the employed people to remain equally well off along the indifference curve.

The indifference curve of the employed people is steeper than that of the unemployed, since the welfare of the employed is relatively sensitive to the tax, whereas the welfare of the unemployed is relatively sensitive to the unemployment benefit.

The level of unemployment at point I is depicted by the iso-unemployment curve U_I , describing the set of points along which unemployment is the same as at point I .⁸ Observe that since a rise in the unemployment benefit b raises unemployment, a fall in the tax rate t is required to keep unemployment constant. Thus the iso-unemployment curve is downward sloping. The closer an iso-unemployment curve

⁷ The line corresponds to the discounted welfare as derived in the model of the appendix.

⁸ For visual transparency, the iso-unemployment curve as well as the indifference curves are depicted as straight lines in the figure, although they are actually curved in practice.

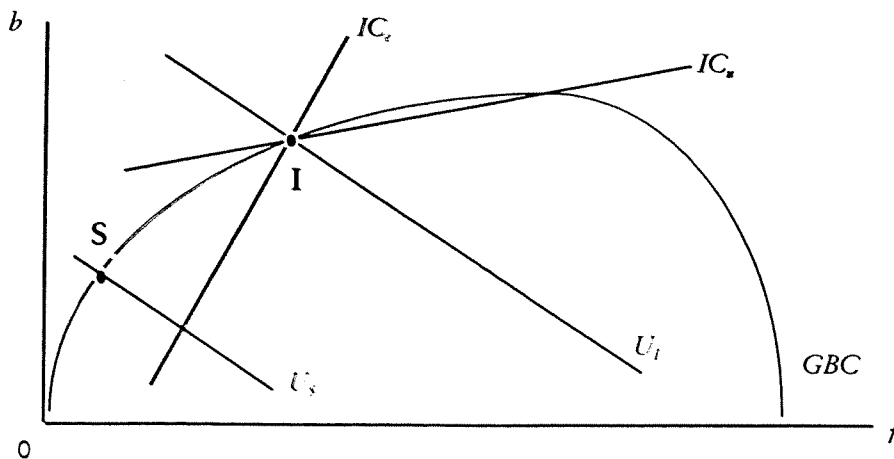
lies to the origin (where $b = t = 0$), the lower the level of unemployment (for the lower is the unemployment benefit and tax rate). Unemployment is minimized at the origin and we assume, plausibly, that this minimum unemployment level is positive.

We now ask whether, starting from the status quo point I , the government can improve people's welfare through benefit and tax reform. The first step is to examine what the aim of government policy should be, namely, the achievement of the socially optimal position.

3.3 The Aim of Labor Market Policy

Let's define the (hypothetical) socially optimal position as the one that would be reached if the government were able to set not only its policy parameters (b and t) but also everyone's search and work decisions, so as to maximize the sum of the welfare of all people. The following figure superimposes the socially optimal position in relation to the status quo position:

Figure 13. The Status Quo versus the Socially Optimal Position



As the figure indicates, moving from the status quo at point I to the socially optimal point S calls for reductions in both the unemployment benefit b and the tax t . The iso-unemployment curve U_s depicts the level of unemployment associated with the socially optimal point. Since this curve lies beneath U_I , unemployment in the status quo is excessive, on account of excessive unemployment benefits and excessive taxes.

Note that social welfare is generally not maximized where unemployment is minimized, i.e. point S does not coincide with the origin. The reason is that since it is impossible for the government to undertake lump-sum transfers among individuals (viz. transfers that do not affect people's incentives),⁹ unemployment and the distribution of income are related to one another. In our analysis, lower unemployment benefits and taxes lead to lower unemployment and greater inequality between the employed and unemployed. At minimum unemployment, the distribution of income between employed and unemployed people is too unequal for social welfare to be maximized. Thus there is a role for the government to offer unemployment benefits that are sufficiently high to avoid excessive inequality without generating excessive unemployment. The social desirable balance between unemployment and inequality is achieved at point S , with positive unemployment.

3.4 The Best that the Political Process Could Possibly Do

Is it possible to reach the socially desirable position S ? Recall that we identified this position by asking a hypothetical question: How would the government set its policy

instruments to maximize the sum of everyone's welfare, provided it could also dictate people's search and work decisions? If the government were indeed able to make all these decisions, it would not face an unemployment-inequality trade-off. For when it made the search and work decisions, it would determine the size of the economic pie (how much was produced in the economy), and when it set its policy parameters (taxes and benefits), it would determine the way the economic pie was distributed among the employed and unemployed people.

But in a free market economy, the government naturally cannot dictate the search and work decisions, although it can influence them indirectly through its tax and benefit policy instruments. That means, however, that the policy instruments are doing double-duty: they simultaneously affect the size *and* distribution of the economic pie. The problem that arises under these circumstances is that the tax and benefit levels that would generate a desirable distribution of income (across the employed and unemployed people) would not offer sufficient inducement to search and work.

If search effort is undesirably low, then the existing employees have little danger of being replaced by the currently unemployed workers, and thus their work effort falls. On the other hand, if work effort is undesirably low, then the unemployed workers do not have to expend as much search effort in order to find jobs, and thus their search effort falls. In this way, deficient search effort leads to deficient work effort and vice versa.¹⁰ This externality is one major reason why the government cannot

⁹ For example, it is impossible to change unemployment benefits and taxes without affecting people's incentives to search and work.

¹⁰ In our model, plausibly, the unemployed choose their level of search effort, taking the work effort of the employed workers as given. The lower the work effort, the less search effort the unemployed need to expend. By the same token, the employed choose their level of work effort, taking the search effort of the unemployed as given. The lower the search effort, the less work effort the employed need to expend.

reach the socially optimal position just by means of its policy parameters (while the work and search decisions are made by the workers).

Another reason is that wage determination is in the hands of the employers and employees. When the employers use wages to stimulate job search and work effort¹¹ and when the “insiders” (incumbent employees whose positions are protected by these turnover costs) use their market to put upward pressure on their wages, these wages will be set above their socially desirable level,¹² discouraging employment.

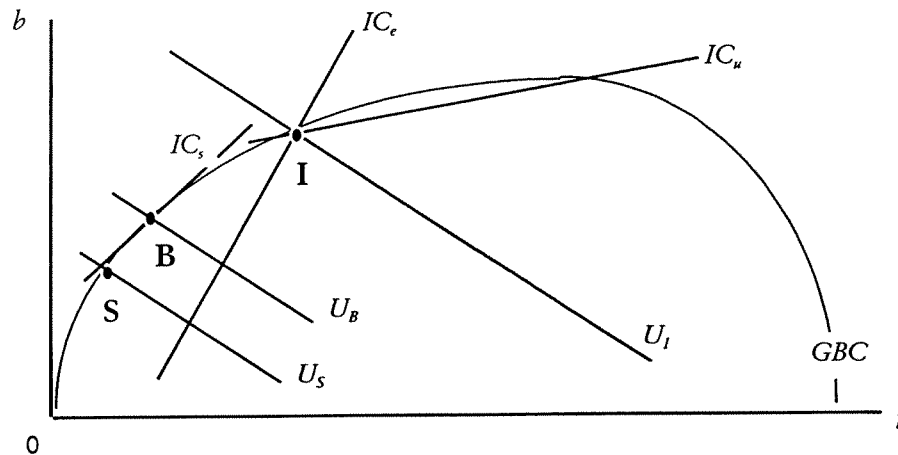
So, given that the wage, work effort, and job search are outside the government’s direct control, what position could the labor market achieve if the political process worked perfectly, that is, if the political process would permit the government to set its policy instruments so as to maximize the sum of everyone’s welfare? We call the resulting labor market position the “Benthamite” position, since it is the political equivalent of Bentham’s goal to achieve “the greatest happiness of the greatest number.”

In our analysis, Benthamite social welfare is a weighted average of the welfare of the employed and unemployed people. Thus the Benthamite indifference curve is a weighted average of the employed and unemployed people’s indifference curves. It is upward sloping, since its slope lies between that of the employment and unemployed people’s indifference curves. The Benthamite position is pictured by point B in the following figure:

¹¹ See, for example, Shapiro and Stiglitz (1984).

¹² See Lindbeck and Snower (1989).

Figure 14. The Best Politically Achievable Position



Note that the Benthamite point is associated with higher unemployment (U_B) than the socially desirable level of unemployment (U_S). After all, the unemployed want more than the socially desirable level of unemployment benefits, since they do not take full account of how these benefits - and the associated taxes - reduce the employed people's chances of retaining their jobs. Furthermore, the employed may receive excessive wages in the status quo position of the labor market (since employers use wages to stimulate job search and work effort and since the employed have market power)¹³ and these people do not take full account of how these wages discourage employment and thereby reduce the unemployed people's chances of finding work. Consequently, both the employed and unemployed may have an incentive to vote for higher unemployment benefits and higher taxes than is socially desirable. The higher are unemployment benefits and taxes in the status quo position, the more excessive will be the benefits and taxes, *even if the political process works perfectly*.¹⁴

¹³ Furthermore, the higher the unemployment benefits, the higher their wages.

¹⁴ The greater are unemployment benefits and taxes in the status quo position, the higher will be the initial level of unemployment. The greater the unemployment level, the greater the voice of the unemployed in the political process (i.e. the more strongly their preferences are weighted in the

In sum, the more excessive the government's benefits and taxes under the status quo, the further the best politically achievable position will be from the socially optimal position (i.e. the further point B will be above and to the right of point S in the previous figure).

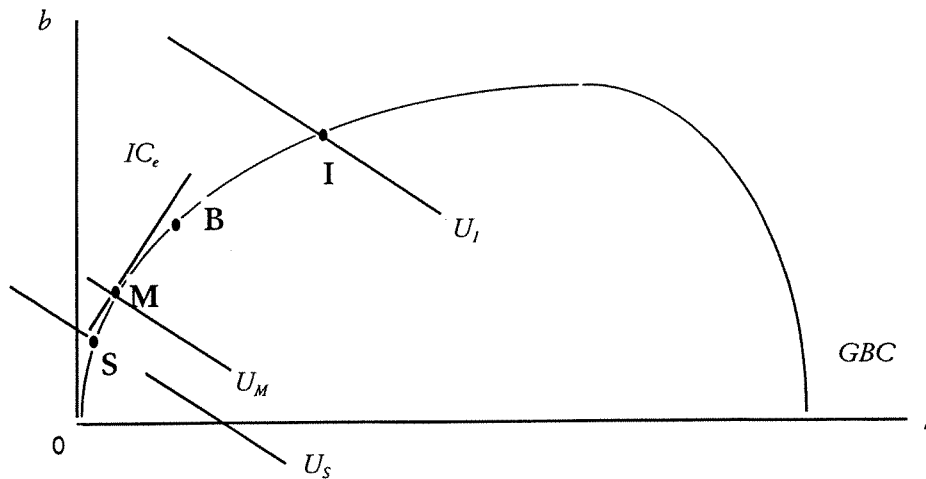
3.5 Political Constraints on Policy Decisions

Let us now shift our attention from the best politically achievable position to what may be politically feasible within the democratic political process. An influential model of this process is the *median voter theory*, which indicates that if political decisions are taken by majority rule, the outcome will be in accord with the preferences of the median voter. Since employed people virtually always outnumber unemployed people by a large margin, the median voter is generally employed. Consequently, in the context of our labor market model, the median voter theory asserts that the voting process will yield a set of policies that make the employed people as well off as possible.

The figure below shows that the highest indifference curve of the employed people is the one that just touches the government budget constraint, so that point *M* is the outcome of the majority voting process.

Benthamite welfare objective), and thus the greater the demands for excessive unemployment benefits. Thus the greater higher will be the unemployment level associated with the best politically achievable position.

Figure 15. The Median Voter Outcome



Observe that point M lies beneath point B (the Benthamite position) along the government budget constraint. After all, point M reflects just the employed people's preferences, whereas point B reflects a weighted average of the employed and unemployed people's preferences; and the employed people are more in favor of tax reductions and less in favor of unemployment benefit increases than the unemployed. Thus the democratic process (via the median voter) leads to lower unemployment benefits and taxes than the outcome from a perfectly functioning political process (the Benthamite position).¹⁵

Nevertheless, the median voter position (point M) lies above the socially optimal position (point S) on the government budget constraint, so that the unemployment

¹⁵ In terms of the geometry of the figure above, observe that the Benthamite indifference curve is a weighted average of the indifference curves of the employed and unemployed people, and that the employed people have the steeper indifference curve. It follows that the employed people's indifference curve must be steeper than the Benthamite indifference curve. Consequently point M must lie beneath point B along the government budget constraint.

rate U_M (associated with the median voter outcome) is greater than the unemployment rate U_S (at the socially optimal position).¹⁶

In practice, however, it is highly unlikely that governments of the advanced, democratic market economies would ride roughshod over the interests of a significant minority of the voting constituency, such as the unemployed. Such behavior would offend against a principle of liberal democracy, namely that the majority is allowed to have its way only if it does not involve sacrificing a significant minority. This principle is not only enshrined in a multitude of political institutions; it also appears to be commonly supported by a majority of voters in these countries. The implications, in practical terms, is that sizable minorities, such as the unemployed, may in effect be viewed as blocking coalitions with regard to policies that hurt them.

Accordingly, in the context of our model, it is reasonable to examine a political process in which only those policies are feasible that improve the welfare of both the employed *and* the unemployed. As the following figure indicates, the set of policies favored by the employed people are those in the shaded area above their indifference curve IC_e and under the government budget constraint, while the set of policies favored by the unemployed people are those in the shaded area above their indifference curve IC_u and under the government budget constraint.

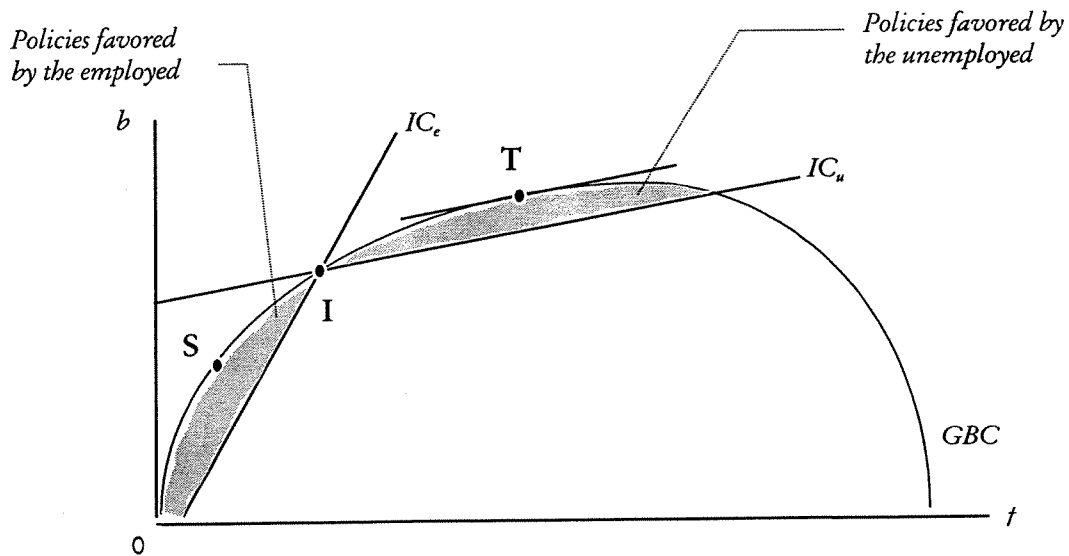
The problem is that, for the scenario depicted by the “Anglo-German nightmare,”¹⁷ these two shaded areas do not overlap. Thus there is *no set of policies* that can be passed by the political process. Consequently the labor market is stuck at wherever

¹⁶ The reasons are essentially the same as those why Benthamite unemployment exceeds socially optimal unemployment.

¹⁷ In this scenario, as shown in the figure, the indifference of the employed people (IC_e) is steeper than the budget constraint at the status quo point I , whereas the indifference curve of the unemployed people (IC_u) is flatter.

it happens to be initially. This phenomenon may be called “political hysteresis;” it helps explain policy paralysis even in the face of high unemployment.

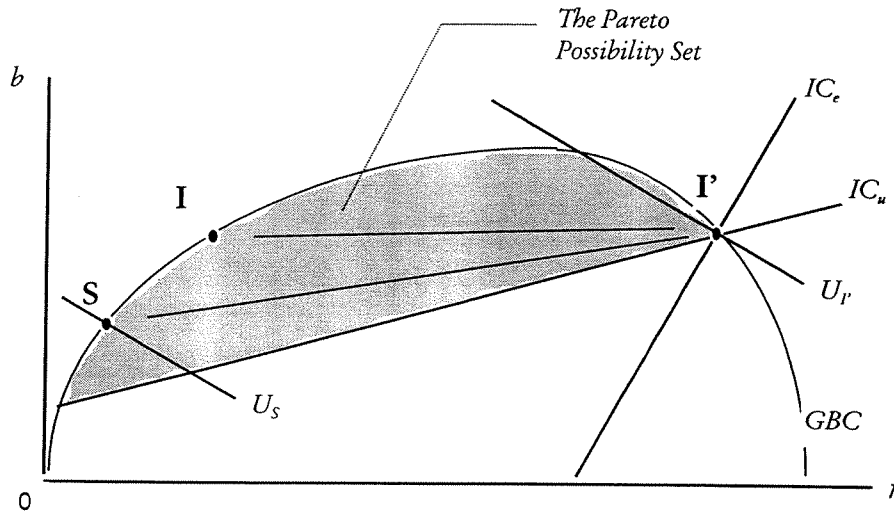
Figure 16. Political Hysteresis



It is easy to see that *all* points on the government budget constraint from 0 to point *T* could represent initial positions characterized by political hysteresis.¹⁸ However if the economy's initial position lies to the right of point *T*, this deadlock may be overcome. For example, at point *I* in the Laffer portion of the government budget constraint in the figure below, the set of policies favored by the employed and unemployed people are those lying above their respective indifference curves (IC_e and IC_u , respectively) and under the government budget constraint. Observe that now there is some overlap between these two areas. Specifically, the unemployed people's area lies completely within the employed people's area, so that the policies on which both

groups could agree now lie in the shaded area, called the "Pareto possibility set" in the figure.

Figure 17. Policy Making under Laffer Conditions



Under these circumstances, socially optimal policy, at point S , may now lie in the Pareto possibility set, as illustrated in the figure. Thus it is now politically feasible for the government to move from point P to the socially desirable point, thereby reducing the unemployment rate from U_p to U_s . In order to do so, however, it needs to implement unemployment benefit reform and tax reform *in conjunction with one another* with the express purpose of exploiting the existing political and economic complementarities. Both policy instruments need to be changed *simultaneously* to move towards the social optimum. Piecemeal, uncoordinated reform - in which one policy reform is undertaken at a time may run the risk of failure, because after the first policy instrument has been adjusted, the economy may arrive at a position of political

¹⁸ Point T is the point of tangency between the unemployed workers' indifference curve and the gov-

hysteresis, preventing the second policy instrument from being adjusted as well.

These considerations set the stage for an analysis of how political constraints on economic policy may be overcome.

4. Overcoming Political Constraints Through Broad-Based Reform

Thus far, the upshot of our analysis has been bleak: Even if the status quo of the labor market is inefficient (due to high unemployment) and inequitable (in terms of the welfare of employed versus unemployed people), it may nevertheless be impossible for the government to implement the appropriate policies on account of political constraints. Once political hysteresis sets in, the economy may be condemned to perpetuate policies that are not in the interests of society.

Is there any other way out of this box? Our analysis points to a promising answer: broad-based reform. This strategy involves abandoning the traditional approach to unemployment policy making, which involves determining the policy instruments on the basis of *political* criteria and then setting the magnitudes of these instruments in accordance with specific *economic* goals. This dichotomy between political and economic decisions has inadvertently been supported through the mainstream economic methodology that takes the set of policy instruments as exogenously given and then optimizes a policy objective function with respect to these instruments. Our analysis suggests that this approach should be replaced by a new strategy: first to identify the group of policy instruments whose unemployment effect is characterized by

ernment budget constraint.

significant economic and political complementarities, and then to set these policy instruments so as to exploit these complementarities.

In short, unemployment policy decisions – concerning both the nature of the policy instruments and the degree to which these instruments are changed - are not to be made in isolation from one another. They must be made jointly, and it is clear why the existence of economic and political complementarities calls for such an approach. In the presence of economic complementarities, individual policy initiatives may be ineffective on their own; their true potential cannot be assessed unless we explore how their influence can be reinforced through other policy initiatives. If the policy measures are implemented in isolation, there is no assurance that such reinforcement will be forthcoming.

Furthermore, isolated policy initiatives are often a recipe for political failure, since each of them on their own commonly has a tendency to create winners and losers. If the losers are sufficiently numerous and powerful, they will be able to block these initiatives, even if the winners stand to gain a lot more than the losers stand to lose. But if politically complementary policies are formulated conjointly, then the losers from one policy can possibly be compensated by becoming the winners of another policy.

To see how this works, let us examine how the problem of political hysteresis in the analysis above could be resolved by broadening the set of policy instruments so as to exploit further economic and political complementarities. Recall that the political hysteresis problem, as depicted in Figure 16, involves a simple conflict of interest: The government is unable to achieve the social desirable position by means of tax and benefit reform, since a reduction of unemployment benefits and taxes would hurt the

unemployed, whereas a rise in benefits and taxes would hurt the employed. Now, however, consider including another instrument in the policy package, namely, vouchers (or tax breaks) for firms that hire currently unemployed people.

Since such hiring vouchers improve the welfare of the unemployed, they could compensate the unemployed for a reduction in unemployment benefits. On the other hand, the vouchers would hurt the employees, since firms would gain an incentive to replace some of their employees with subsidized new recruits. But the employees could be compensated for this loss by a reduction in taxes, made possible through a reduction in unemployment benefits.

The political possibilities for policy reform that emerge with the expansion of the policy package can be illustrated clearly in terms of Pareto possibility sets. Recall that for the baseline model above - in which only unemployment benefit and tax policies are used, as specified in the appendix and illustrated in Figure 16 - the Pareto possibility set is empty, so that no policy change is politically feasible. In the baseline model,¹⁹ the replacement ratio (the ratio of unemployment benefits to the wage) is 0.4, the tax rate is 0.1, and the corresponding hire rate is 0.24. Now consider what happens to the Pareto possibility set when a hiring voucher (financed through reductions in unemployment benefits and taxes) augments the tax and benefit policies: specifically, the inclusion of a voucher that is sufficient to raise the hire rate to 0.25,²⁰ given the replacement ratio and tax rate above. This broadening of the policy portfolio creates a range of tax-benefit policies that improves the welfare of *both* the em-

¹⁹ The other parameters are specified in Appendix 2.

²⁰ Since the corresponding magnitude of the voucher depends on the detailed parameterization of the model, it is more convenient to describe the voucher in terms of its effect on the hire rate.

ployed *and* unemployed people and consequently is politically feasible. The feasible range of policies is pictured by Pareto possibility set in the figure below.

Figure 18. The Pareto Possibility Set Created by a “Small” Hiring Voucher

[Insert figure here]

The set covers 5.57% of the tax-benefit rectangle in the figure.

A larger hiring voucher generates a larger Pareto possibility set, viz. a wider range of politically feasible, welfare improving tax-benefit policies. For instance, a voucher that raises the hire rate to 0.29 (given the replacement ratio and tax rate above) yields the following Pareto possibility set:

Figure 19. The Pareto Possibility Set Created by a “Large” Hiring Voucher

[Insert figure here]

This set covers 41.29% of the tax-benefit rectangle in the figure. These results illustrate the potential political payoffs from broad-based policy reform.

It is important to emphasize that - just as for the case of tax and benefit reform in the Laffer portion of the government budget constraint (described at the end of the previous section) - the political gains from *broad* reform can be reaped only if the reforms are undertaken *simultaneously and in conjunction with one another*. Suppose that, on the contrary, a government - saddled with high unemployment, unemployment benefits and taxes - introduces a hiring voucher without at the same time im-

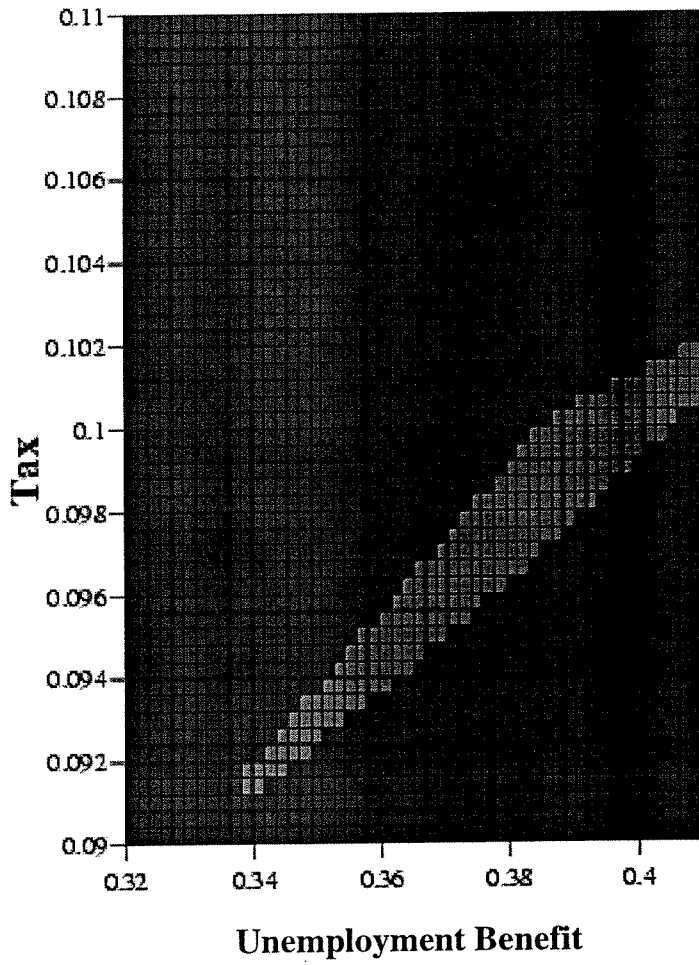


Figure 18: The Pareto Possibility Set Created by a ‘Small’ Hiring Voucher.

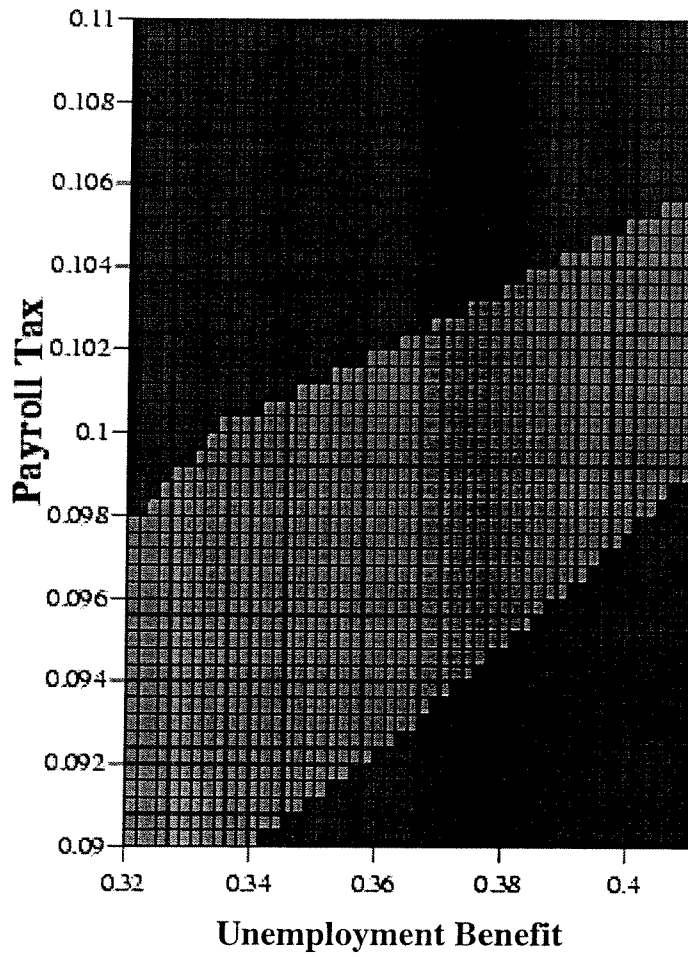


Figure 19: The Pareto Possibility Set Created by a “Large” Hiring Voucher.

plementing unemployment benefit reform and tax reform. Then the hiring vouchers may reduce unemployment, thereby generating a government budget surplus that allows the government to reduce unemployment benefits and taxes. Once these initial adjustments have been made, however, the political deadlock about any further unemployment benefit reform and tax reform would remain. Only through a *simultaneous* implementation of hiring vouchers, unemployment benefit reductions, and tax reductions can political hysteresis be overcome and sizable expansions of the Pareto possibility set be fully realized.

An implication of the political complementarities above is the principle that “the bad policies drive out the good,” i.e. the effectiveness and political feasibility of enlightened policies may be thwarted by the inclusion of unenlightened policies. For instance, suppose that the policy maker faces a choice of two alternative policy packages. One is an “enlightened” package that places the labor market inside the Pareto possibility set of Figure 18 above. The other is the same package, except that there is an “unenlightened” increase in unemployment benefits, taking the labor market equilibrium outside the Pareto possibility set (i.e. into the dark area lying to the right of the Pareto possibility set in the figure). Observe that while the first package is welfare improving and politically feasible, the second package is not. In this way, a “bad” policy has ruined the effectiveness of the other policies and destroyed the political opportunity to get these policies implemented.

5. Concluding Thoughts

In sum, our analysis provides a possible explanation for two widespread policy problems in Europe: the disappointingly small unemployment effect of many past reform measures to stimulate job creation and job search, and the political difficulties

in implementing more extensive reform programs. We argue that these problems arise not because the considered reform measures are inherently ineffective, nor because these measures inevitably replace European-style unemployment by American-style inequality. Rather, what may lie at the heart of the difficulty is the failure of many European governments to consider the implementation of broad-based reform strategies that exploit policy complementarities.

Complementary policies call for a distinctive approach to policy making. When only a small number of unemployment policies - from a broader group of complementary policies - is under consideration, it may be politically impossible to implement them and, even if they were implemented, their influence on unemployment would be small. It is only when a broad set of policies is all implemented in conjunction with one another that they become politically feasible and economically effective.

If our analysis captures something significant, then the timid approach to policy making may simply not be an option. Incremental, small-scale adjustments of existing policy packages may be doomed to failure. Perhaps the only way to tackle the European unemployment problem is to have the courage to think big and broad.

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APPENDIX: AN INCENTIVE MODEL FOR POLICY ANALYSIS

We assume that all workers retire with probability d each period. A worker who is unemployed is hired with probability h ; otherwise, the worker will either die or be unemployed next period. An employee who has been employed periods faces a probability f of becoming unemployed, a probability d of leaving the labour force permanently and a probability $1 - f - d$ of retaining a job.

It is straightforward to extend this model to incorporate savings, but it is a reasonable abstraction that as a first approximation low wage workers on welfare state benefits do not have access to capital markets and have little saving. Unemployed workers receive unemployment benefits and divide their time between leisure and job search; employed workers divide their time between leisure and work. The hiring rates will be shown to depend on job search intensity (and thus are negatively related to the leisure of the unemployed workers), and the firing rates will be shown to depend on productivity, which depends on the length of time spent working (so that firing rates are negatively related to the leisure of the employed workers). Workers make their search-leisure and work-leisure choices so as to maximize their discounted lifetime utilities, taking into account the effects of these choices on the hiring and firing rates. For simplicity, workers are assumed to have no access to capital markets.

Incentives to Search and Work. Let l_u be the leisure of a worker who is unemployed and $h = h(l_u)$ be that worker's hiring rate. Furthermore, let $u(b, l_u)$ be the worker's current utility (where consumption and leisure are non-substitutes: $u_{12} \geq 0$) and b is his unemployment benefit. Finally, let $V(u)$ be the present value associated with being unemployed, and $V(e)$ be the value of being employed. Then the worker's problem is to make his leisure decision so as to maximize his present value of utility:

$$(1) \quad V(u) = \max_{l_u} [u(b, l_u) + \beta [h(l_u)V(e) + (1 - h(l_u) - d)V(u)]]$$

The resulting first-order condition is

$$(2) \quad u_{l_u} = -\beta h'(l_u) [V(e) - V(u)].$$

In other words, the marginal utility of leisure must be set equal to the discounted marginal hiring propensity ($-\beta h'$) times the penalty for not finding a job ($V(u) - V(e)$). Since there is diminishing marginal utility

of leisure, the optimal level of leisure depends inversely on the penalty for job loss.

The decision making problem of an employed worker may be expressed along analogous lines. Let l_e be the leisure of an employed worker and $f = f(l_e)$ be that worker's separation rate. Let w be the wage and τ be the rate of payroll tax. Then the employed worker's current utility is $u(w(1 - \tau), l_e)$ and his decision making problem is to solve:

$$(3) \quad V(e) = \max_{l_e} [u(w(1 - \tau), l_e) + \beta (f(l_e)V(u) + (1 - f(l_e) - d)V(e))]$$

The associated first-order condition is

$$(4) \quad u_{l_e} = \beta f'(l_e) [V(e) - V(u)].$$

Here, the marginal utility of leisure must be set equal to the discounted marginal firing propensity ($-\beta f'$) times the penalty for job loss ($V(e) - V(u)$). Once again, diminishing marginal utility of leisure implies that the optimal level of leisure depends inversely on the penalty for job loss.

The Workers' Decisions. To implement the model, we consider a specific functional form for the workers' utility and examine their leisure decisions when unemployed (l_u) and employed (l_e). The workers face the following hire and fire functions:

$$(5) \quad h(l_u) = \theta (1 - a l_u).$$

$$(6) \quad f(l_e) = \phi l_e$$

To motivate the hire rate, we consider that workers going to interviews at a firm face a hire rate of ω which is known to the workers. Workers have a time endowment of 1 when unemployed and obtaining an interview takes c units of time. Workers who do one interview are hired with a probability ω ; if they are not hired (with probability $1 - \omega$), they may proceed to a second interview and be hired with a probability ω . The probability ω is determined by the firm's profit-maximizing behavior, described later.

Thus each worker's hiring rate (the total probability of being hired) is

$$(7) \quad h = \omega \sum_{k=0}^{N-1} (1 - \omega)^k = 1 - (1 - \omega)^N$$

This hiring rate may now be expressed in terms of the unemployed worker's leisure. The worker's total time endowment (to be split between leisure and job search) is 1, and N interviews take δN units of time, where δ is a positive constant. Thus, leisure when unemployed is $1 - \delta N$ so that $N = \frac{1-l_u}{\delta}$. Hence

$$(8) \quad h(l_u) = 1 - (1 - \omega)^{\frac{1-l_u}{\delta}}$$

which is decreasing in the leisure when unemployed. A linear approximation to Eq. (8) is:

$$(9) \quad h(l_u) = 1 + \log(1 - \omega) \frac{(l_u - 1)}{\delta}$$

which can be rewritten as Eq. (5). We shall use this linear hiring function in the ensuing analysis.

Next, consider a simple, illustrative way to motivate the firing rate. Suppose that output per worker is given by the production function $q = \frac{\epsilon}{l_e}$, where ϵ is a random variable uniformly distributed between 0 and α (a positive constant), iid across workers. Let the firm have a threshold level of output \bar{q} below which it fires the employee and above which it retains him. Then the firing rate (probability of firing a worker) is $f = (\bar{q}l_e/\alpha)$. Thus the firing rate can be expressed simply as Eq. (6) where $\phi = \bar{q}/\alpha$.¹

For these hiring and firing functions, let us derive the worker's leisure decision when unemployed (l_u) and employed (l_e). Suppose that the unemployed and employed workers have the same instantaneous utility function,

$$(10) \quad u(c, l) = \frac{(c^\alpha l^{1-\alpha})^\gamma}{\gamma}$$

¹Another way of justifying Eq. (6) is as a technological relationship between monitoring of workers and work effort. Alternatively, it may be justified in terms of a quitting model; workers who wish to quit supply little effort and it is for the firm to raise the wage in order to induce them to supply more labor.

where c is the consumption and l is leisure. Since the worker is assumed to consume all his current income, $c = b$ for an unemployed worker (where b is the unemployment benefit) and $c = w^*$ for an employed worker (where w^* is the wage), and b and w^* are predetermined when the workers make their leisure decisions.

Substituting the derivatives of Eq. (10) and (5) into Eq. (2), we obtain the optimum interior² choice of leisure when unemployed as:

$$(11) \quad l_u = \left[\frac{\beta a \theta}{1 - \alpha} (V(e) - V(u)) \right]^{\frac{1}{(1-\alpha)\gamma-1}} b^{-\frac{\alpha\gamma}{(1-\alpha)\gamma-1}}$$

An employed workers' take-home pay is: $w^* = w(1 - \tau)$ where τ is the tax rate. For those employed, the Cobb-Douglas utility function (5) implies that the optimum interior³ choice of leisure when employed:

$$(12) \quad l_e = \left[\frac{\beta \phi}{1 - \alpha} (V(e) - V(u)) \right]^{\frac{1}{(1-\alpha)\gamma-1}} [w^*]^{-\frac{\alpha\gamma}{(1-\alpha)\gamma-1}}$$

These first order conditions are then substituted back into the optimal value equations and a solution for the value function is then derived. From the value function solution, hire and fire rates are determined using Eqs. (5) and (6).

We define:

$$(13) \quad \Delta V = V(e) - V(u)$$

Substituting Eqs. (11) - (12) into the value function equations (1) and (3), we obtain:

$$(14) \quad (1 - \beta(1 - d))V(u) = F [\Delta V]^z + \beta\theta\Delta V$$

$$(15) \quad (1 - \beta(1 - d))V(e) = G [\Delta V]^z$$

where:

²The hire rate in Eq. (5) must lie between 0 and $1 - d$. This implies that:

$$\frac{1}{a} \left[1 - \frac{1-d}{\theta} \right] \leq l_u \leq \frac{1}{a}.$$

³The hire rate in Eq. (12) must lie between 0 and $1 - d$ so that $0 \leq l_e \leq \frac{1-d}{\phi}$.

$$(16) \quad z - 1 = \frac{1}{(1-\alpha)\gamma - 1} < 0,$$

(17)

$$F = b^{\frac{-\alpha\gamma}{(1-\alpha)\gamma-1}} (\beta a \theta)^{\frac{(1-\alpha)\gamma}{(1-\alpha)\gamma-1}} \left[\frac{1}{1-\alpha} \right]^{\frac{1}{(1-\alpha)\gamma-1}} \left(\frac{1}{\gamma} \left[\frac{1}{1-\alpha} \right] - 1 \right)$$

(18)

$$G = (w^*)^{\frac{-\alpha\gamma}{(1-\alpha)\gamma-1}} (\phi\beta)^{\frac{(1-\alpha)\gamma}{(1-\alpha)\gamma-1}} \left[\frac{1}{1-\alpha} \right]^{\frac{1}{(1-\alpha)\gamma-1}} \left(\frac{1}{\gamma} \left[\frac{1}{1-\alpha} \right] - 1 \right)$$

We note from Eq. (14) and Eq. (15):

$$(19) \quad V(u) = \frac{F}{1-\beta(1-d)} [\Delta V]^z + \frac{\beta\theta}{1-\beta(1-d)} \Delta V$$

$$(20) \quad V(e) = \frac{G}{1-\beta(1-d)} [\Delta V]^z$$

Subtracting Eq. (19) from Eq. (20), we obtain:

(21)

$$\left(1 + \frac{\beta\theta}{1-\beta(1-d)} \right) \Delta V = \left[\frac{G}{1-\beta(1-d)} - \frac{F}{1-\beta(1-d)} \right] [\Delta V]^z$$

so that if ΔV is nonzero (which is true if $V(u)$ is bounded):

(22)

$$\left(1 + \frac{\beta\theta}{1-\beta(1-d)} \right) = \left[\frac{G}{1-\beta(1-d)} - \frac{F}{1-\beta(1-d)} \right] [\Delta V]^{z-1}$$

and:⁴

⁴We note from Eq. (16) that:

$$z - 1 = \frac{1}{(1-\alpha)\gamma - 1} < 0,$$

implying boundedness.

$$(23) \quad \Delta V = \left[\frac{\left(1 + \frac{\beta\theta}{1-\beta(1-d)}\right)}{\left[\frac{G}{1-\beta(1-d)} - \frac{F}{1-\beta(1-d)}\right]} \right]^{\frac{1}{z-1}}$$

Using Eq. (20) and Eq. (23), we obtain the following explicit solutions:

$$(24) \quad V(e) = \left[\frac{\left(1 + \frac{\beta\theta}{1-\beta(1-d)}\right)}{\left[\frac{G}{1-\beta(1-d)} - \frac{F}{1-\beta(1-d)}\right]} \right]^{\frac{z}{z-1}} \frac{G}{1-\beta(1-d)}$$

$$(25) \quad V(u) = V(e) - \left[\frac{\left(1 + \frac{\beta\theta}{1-\beta(1-d)}\right)}{\left[\frac{G}{1-\beta(1-d)} - \frac{F}{1-\beta(1-d)}\right]} \right]^{\frac{1}{z-1}}$$

The Firms' Decisions. The firm maximizes profits given by the discrete-time Hamiltonian:

$$(26) \quad \mathcal{H} = v^t [\Lambda - w - c(\phi, f) - T(h)] E_t + \lambda_{t+1} E_{t+1}$$

and the equation of motion is:

$$(27) \quad E_{t+1} = (1 + h - q - d)E_t$$

where v is the discount rate, $T(h)$ are training costs and $c(\phi, f)$ are personnel management costs (including costs for redundancies f).

We define: $\mu_{t+1} = \lambda_{t+1}\beta^{-t}$ and obtain the first order conditions with respect to the wage and μ_t :

$$(28) \quad -1 = \mu_{t+1} \frac{df}{dw}$$

$$(29) \quad v\mu_t = [\Gamma - w - c(\phi, f) - T(h)] + (1 + h - f - d)\mu_{t+1}$$

We focus on steady states. The firm perceives that if it alters the wage, it can alter the supply of effort by the worker. Hence, the specific computation of $\frac{df}{dw}$ treats the value of the unemployed V_U as fixed but given the fixed level of V_U the firm is assumed to be able to influence V_E .

Model Parametrization. The quantitative figures and tables in the paper use the following parameterization of the consumer model: $\gamma = 0.5$, $\phi = 0.80$, $\beta = 0.99$, $\alpha = 0.97$, $\gamma = 0.50$, $d = 0.005$, $\theta = 0.25$, $a = 0.50$, $b = 0.55$, $w = 1.0$, $\tau = 0.10$. In this case, the fire rate is about 0.021, the hire rate is 23.3%, and unemployment is about 10%. In addition to this parameterization of the consumer side, we also investigated various parameterizations of the firm, but to generate conservative estimates of economic complementarities, the quantitative figures and tables assume that the wage is fixed.

To evaluate the reasonableness of these parameters, we define the long-term unemployed to be those unemployed for at least a year (4 periods). If the transition rate out of unemployment is a constant h , then the steady state proportion of people who are unemployed for more than x periods is $(1 - h)^x$. Thus, the fraction of the unemployed who are long-term unemployed is $(1 - h)^4$. In Britain, roughly 36% of the unemployed have been jobless for over a year: $(1 - h)^4 = 0.36$, where h is deadweight (the hire rate in the absence of vouchers). This suggests that, under our Markov assumptions, the deadweight parameter is 0.2254 which is very close to our hire rate of .233%.

Furthermore, it can be shown⁵ that if the rate of outflow from unemployment is h , then the mean duration of an unemployment spell is $\frac{1}{h}$. Our separation rate is 0.021 which corresponds to an average job tenure of roughly ten years.

⁵To see this, observe that $(1 - f)^x v_0^s$ is the number of people who have been employed for x periods, where v_0^s is the steady state number of entrants to employment. The probability of being fired after x periods is therefore $f(1 - f)^{x-1}$. Thus, the mean duration of unemployment is: $\sum_{x=1}^{\infty} x f (1 - f)^{x-1}$. Noting that the mean duration of employment is f times $\sum_{x=1}^{\infty} (1 - f)^x = \frac{1}{f} - 1$, we arrive at the result by differentiation.