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Government Employment and Wages and Labor Market Performance¹

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Abstract

Government wage, benefit, and employment decisions are not taken on a profit-maximizing basis and have a substantial impact on aggregate labor market performance and unemployment. In a two-sector labor market model with free mobility of labor, an increase in government wages or benefits reduces private sector employment, and government employment is not an effective counter-cyclical instrument. Empirical tests for Greece confirm that the expansion of the public sector in the 1980s contributed to the deterioration of labor market performance.

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I. INTRODUCTION

The consensus view that has emerged in the literature on the rise and persistence of unemployment in Europe during the last quarter-century can be summarized as follows. The rise in unemployment during the 1970s and 1980s was caused by a number of factors, primarily on the demand side (terms-of-trade shocks, a rising tax burden, and perhaps rising real interest rates); but also on the supply side (increasing real wage resistance, due in turn to expanding unemployment benefits and greater union militancy). In addition, once unemployment rose, it persisted at high levels through the late 1980s and 1990s. This can be attributed to persistence in real wage aspirations, negative effects of long spells of unemployment on search intensity and human capital accumulation, extensive employment protection legislation, capital decumulation in response to high wages, and perhaps insider membership dynamics².

This literature has identified the government policies that are behind many of these factors, notably macroeconomic policies, taxation, unemployment benefit and training schemes, and labor market legislation. However, relatively little attention has been paid to the way the government acts as an employer, and its direct effect on labor market performance. This reflects the implicit assumption that the government's employment and wage decisions do not merit separate consideration, either because they are made on more or less the same grounds as those of private sector employers, or because they have no particular bearing on overall labor market performance.

Both of these postulates are questionable. On the one hand, public choice theory has argued that government actions—and particularly government employment policy—are dictated by the interests of the bureaucracy and the need to provide political favors to interest groups (including public sector unions) in order to stay in office (Niskanen 1971; Buchanan 1977; Courant *et al.* 1979); Freeman (1986) has shown that wage determination through bargaining in the public sector leads to a different outcome than in the private sector, because of the public sector unions' ability to exploit the political process³; and in their survey, Ehrenberg & Schwarz (1986) conclude that "labor market models based upon [...] profit maximization are clearly inappropriate for the government sector". On the other hand, there is strong empirical evidence that the size of the government has a negative impact on overall growth performance (see Barro 1990 and the references therein), as well as some evidence that it has positive

² The evidence is reviewed in, among others, Newell & Symons (1985), Bean *et al.* (1986), Jackman *et al.* (1990), and Layard *et al.* (1991). Fitoussi & Phelps (1988) examine the role of rising real interest rates during the 1980s in a "customer market" pricing model. Alogoskoufis & Manning (1988a and 1988b) explore the causes of unemployment persistence. Pissarides (1992) draws attention to the loss of skills during long spells of unemployment. Lazear (1990) and Heylen (1993) discuss the effect of job security provisions. A thorough survey of the vast literature is provided in Bean (1994).

³ This is different than a situation of wage leadership, which may arise simply as a result of the government's relative size as an employer.

effects on unemployment persistence (Barro 1988; Layard *et al.* 1991). Despite this, there have been few attempts thus far to model explicitly the decision-making process of the government as an employer and its impact on the labor market.

In this paper, we develop a simple model of the labor market with endogenous unemployment, in which government and private sector employers compete for workers but make employment and wage decisions on the basis of different objective functions; and workers decide to which sector to seek employment so as to maximize expected utility. This model allows us to trace the effects of the government's wage and employment policies on the labor market. We find that government policies aimed at lowering unemployment may be counterproductive, by influencing wage and employment decisions of private sector employers and job search decisions of workers. We then test the predictions of our model empirically against data from Greece, where the public sector is not only large, but its significant expansion during the late 1970s and the 1980s went hand-in-hand with a steady deterioration in labor market performance. The results suggest strongly that understanding labor markets in countries with a large public sector, like Greece, requires taking explicitly into account the actions of the government as an employer.

The following section discusses some stylized facts about the government's employment and wage policies that are reflected in the design of the model; section 3 describes the model; section 4 reviews labor market performance in Greece and reports the results of the empirical tests; and section 5 summarizes the conclusions.

II. INTERNATIONAL EVIDENCE ON THE GOVERNMENT'S EMPLOYMENT AND WAGE POLICIES

The government is a large employer: during the last two decades, the government kept on its payroll 17 percent of all employed people in the OECD area and 28 percent of all those employed in the formal sector in developing countries. The difference between the measured government shares in the two groups of countries is due to the relative size of the formal sector: measured against total population, government employment is much more prevalent in the OECD area (7.1 percent) than in the developing world (2.2 percent). This result highlights the positive correlation reported in the cross-country study by Heller & Tait (1983) between the share of government employment and the level of GDP per capita.

In a more careful analysis, Kraay & Van Rijckeghem (1995), using data from 21 OECD and 34 developing countries for the period 1972–92, found that, although the correlation between level of income and government employment was present in cross-country regressions using country means, it was insignificant in pooled regressions with dummies for countries. In the latter, there was instead a strong positive time trend (also confirmed by analyzing separately the evidence from OECD and developing countries), which the authors interpret as suggesting an inherent expansion of the government over time. In line with other empirical work (see the survey in Stevenson 1992), they also found strong evidence of counter-cyclical hiring by the government. These results are *prima facie* consistent with the public choice theory

interpretation of the government's employment decisions as the result of interest group pressure or political considerations⁴.

The evidence on government pay policy is harder to interpret. There is strong evidence that government wages are positively correlated with the level of government resources, and negatively correlated with the level of private sector employment (Kraay & Van Rijckeghem 1995). Moreover, in many countries there appears to be little correlation between public and private sector wages (Agénor 1995), and there is some evidence of persistent public/private wage differentials. Heller & Tait (1983) found a positive wage differential between public and private sector wages in developing countries, although the evidence for OECD countries was weaker. Similar findings from a number of country studies are summarized in Stevenson (1992). However, most of these studies assume—incorrectly—that workers are distributed randomly between the public and private sectors. Using proper earnings functions, van der Gaag *et al.* (1989) found a negative public/private differential at the entry level in two developing countries while, on the contrary, Ehrenberg & Schwarz (1986) reviewed a large number of sectoral studies for the US and concluded that there is a small but persistent positive public/private wage differential, which is not compensating for differences in employment conditions.

The sign and size of the wage differential notwithstanding, government employment in most countries carries substantial additional advantages in terms of job security (in many cases, governments effectively offer employment for life), as well as fringe benefits (generous pension systems, access to subsidized loans, housing allowances, etc.). That these are an important component of the total compensation package is indicated by the behavior of government employees, who often accept wage compression more willingly than cuts in nonwage benefits.

This quick overview highlights a few stylized facts about government employment and wage policies. The government is an important employer, especially in industrial countries, and its decisions influence the private sector. Its hiring is dictated at least partly by non-market considerations: in particular, there is an inherent tendency to expand over time and to hire counter-cyclically in the short run. Government wages may also be determined differently than private sector wages, and this difference is compounded by substantial gaps in the degree of job security and in nonwage benefits in the two sectors. These stylized facts are incorporated in the model presented in the following section.

⁴ Although Gemmel (1990) shows that public employees' preferences do not invariably dictate an expanding public sector.

III. A SIMPLE TWO-SECTOR MODEL WITH ENDOGENOUS UNEMPLOYMENT

The model has essentially two blocks: in the labor market, identical workers decide to apply for either private or government jobs depending on the wages and the respective probabilities of obtaining (and keeping) a job; and in the private sector, employers set wages to maximize profits given, *inter alia*, the level of government wages and employment. These two blocks determine private sector employment, total unemployment, and the relative wage at equilibrium as a function of the level of government employment and wages and the parameters of the model. A third block, in which the government determines government employment and wages based on its own objective function, provides closure. For the possibility of an equilibrium with endogenous unemployment to arise, labor enters the private sector production function with an effort function. Thus, in this model—as in real life—the government's wage and employment decisions affect the economy-wide average wage and aggregate employment and unemployment through two channels: voluntary worker flows between jobs, and the private firms' optimizing decisions. We describe these blocks of the model in turn.

A. The labor market

We use a standard flows model to describe the labor market. For workers, there are three possible states: employment in the government (g), employment in the private sector (p), and unemployment (*U*). We assume for simplicity that it is not possible to move directly from g-employment to p-employment, or vice versa; in other words, moving across sectors involves a spell of (frictional) unemployment.

Let α_g , α_p be the probabilities of entry into employment in sectors g and p, respectively, and s_g , s_p the (exogenous) exit probabilities from employment into unemployment, or separation rates. In a stationary equilibrium, the expected values of the three states V_g , V_p , V_u are given by:

$$V_g = (1-s_g)W_g + s_g V_u \quad (1)$$

$$V_p = (1-s_p)W_p + s_p V_u \quad (2)$$

$$V_u = \alpha_g V_g + \alpha_p V_p + (1-\alpha_p-\alpha_g)B \quad (3)$$

where *B* is the unemployment benefit. It should be noted that W_p and W_g here represent not just the basic cash wages paid in each sector, but more broadly the payoff (real or perceived) to the worker from being employed in each sector. This includes elements such as nonwage payments, conditions of employment, pension and other benefits, etc, *except* length of tenure in each sector, which is modeled explicitly. At steady state, the flows into and out of employment in each sector are equal. This yields:

$$\begin{aligned}\alpha_p U &= s_p L_p & \text{or} & & \alpha_p &= \frac{s_p L_p}{U} \\ \alpha_g U &= s_g L_g & \text{or} & & \alpha_g &= \frac{s_g L_g}{U}\end{aligned}\tag{4}$$

Assuming for simplicity that the unemployment benefit B is equal to zero, and using (4), (3) can be rewritten as

$$V_u = \frac{s_g L_g}{U} V_g + \frac{s_p L_p}{U} V_p\tag{5}$$

At labor market equilibrium, worker flows will equalize the expected value of each state. When $V_g = V_p = V_u$, equations (1), (2), and (5) give us an equilibrium condition for the labor market:

$$\frac{W_p}{W_g} = \frac{(1-s_g)(s_g s_p L_g + s_p^2 L_p - U)}{(1-s_p)(s_g s_p L_p + s_g^2 L_g - U)}\tag{6}$$

Condition (6) can be further simplified if we assume a constant labor force L and normalize at $L = 1$, so that $L_g + L_p + U = 1$, where L_g, L_p are now the shares of each sector's employment to the labor force and U is the unemployment rate. These assumptions do not affect the results.

$$\frac{W_p}{W_g} = \frac{(1-s_g)(s_p s_g L_g + s_p^2(1-L_g-U)-U)}{(1-s_p)(s_g^2 L_g + s_g s_p(1-L_g-U)-U)}\tag{7}$$

Expression (7) is the first key condition of the model. It describes the relationship at steady-state equilibrium between the wage differential W_p/W_g , the share of employment in the government sector L_g , and the unemployment rate U . It has the following properties:

$$\frac{W_p}{W_g} > 1 \quad \text{if } s_p > s_g \text{ and } U > s_p L_p + s_g L_g\tag{8}$$

$$\frac{\partial(W_p/W_g)}{\partial U} > 0 \quad \text{if } s_p > s_g\tag{9}$$

$$\frac{\partial(W_p/W_g)}{\partial L_g} > 0 \quad \text{always}\tag{10}$$

Although $W_p/W_g = f(L_g, U)$ is highly nonlinear, the intuition behind it and its properties is straightforward. If the separation rate in the private sector is higher than that in the government sector, and thus employment in the former is more “risky” from the worker’s point of view; and if, in addition, unemployment lasts more than one period ($U > s_p L_p + s_g L_g$);⁵ then workers will demand a premium for accepting employment in the private sector, as indicated by (8). The size of this premium, and therefore the size of the differential W_p/W_g , will depend on the difference between s_p and s_g and on the magnitude of unemployment. This positive correlation between unemployment and the wage differential in (9) is a central feature of our model. It is also similar to that derived in the segmented labor market literature (see for example Corden & Findlay 1975; Mincer 1976; Demekas 1990), in which wages in the “primary” and “secondary” sectors are related through unemployment.

Note that long-term unemployment (i.e., unemployment above its frictional level $s_p L_p + s_g L_g$) is a necessary but not sufficient condition for a positive wage differential: in this labor market, a wage differential can arise only if there is long-term unemployment, but long-term unemployment may exist even if $W_p = W_g$ (if for some reason wages are fixed above market-clearing levels). Note also that (7) does not *explain* the emergence of either long-term unemployment or a positive wage differential at equilibrium, but describes how they are related if they are present. The next section furnishes an explanation for the emergence of equilibria with both a positive wage differential and long-term unemployment.

Even without a formal analysis of the private and the government sectors, the discussion of the mechanics of labor market equilibrium already provides some insights on the impact of the government’s wage and employment decisions on the labor market. When government wages (or nonwage benefits) are increased, the expected value of being employed in the government rises. To equalize the expected returns, workers would quit the private sector and join the pool of unemployed in search of a government job. This would *ceteris paribus* tend to increase both W_p and U until equilibrium is restored. On the other hand, when government employment is increased, the final result is less clear-cut. In the first instance, an increase in L_g would reduce unemployment directly, as hiring would take place from the existing pool of unemployed workers. This initial fall in unemployment, however, would increase V_u , since the probability of being hired from a smaller pool is now higher, and induce worker flow out of the private sector. This, in turn, would tend to increase W_p —hence the positive correlation between W_p/W_g and L_g indicated by (10)—as well as unemployment until equilibrium is restored. It is not *a priori* clear whether this second-round increase on unemployment would be smaller or larger than the initial fall, but the discussion suggests that, at a minimum, increases in government employment have less than a one-for-one impact on aggregate

⁵The condition $U > s_p L_p + s_g L_g$ can be re-written using (4) as $1 > \alpha_g + \alpha_p$. Given that a one-period spell in unemployment is required in case of separation by our assumption that all flows between sectors go through unemployment, $1 - \alpha_g - \alpha_p$ is the probability of remaining unemployed beyond this time. If this probability is nonzero, then $1 > \alpha_g + \alpha_p$ with a strict inequality, and the condition for $W_p/W_g > 1$ is satisfied.

employment. These insights are confirmed by the formal analysis of the private employers' reaction to the government wage and employment decisions in the next section.

B. The Private Sector

We assume that the production of the private sector good is described by a well-behaved production function, in which labor enters multiplied by an effort function ψ . This specification, in which labor enters the production function in terms of "efficiency units" ψL_p (effort is labor-augmenting), generates wage inflexibility in the private sector (Solow 1979).⁶ Otherwise, cost-minimizing private employers would always drive W_p to the lowest possible level which, with the simplifying assumptions of a constant non-binding labor supply (i.e., zero reservation wage for workers) and zero unemployment benefit, would be equal to W_g . In this case, the wage differential would disappear and unemployment would be minimized at the frictional level $s_p L_p + s_g L_g$. Therefore, in our model, a labor-augmenting effort function in the private sector is the mechanism that can generate equilibria with long-term unemployment and a positive wage differential. Although introducing an effort function also in the production of the public good would perhaps be more realistic, it is not strictly necessary, and has been omitted for the sake of simplicity; in any event, it would not affect the results.

In standard efficiency wage literature, effort is an increasing function of the wage W_p relative to some benchmark expected wage W^e , or $\psi(W_p/W^e)$, with $\psi' > 0$ and $\psi'' < 0$. In an economy with unemployment, this benchmark expected wage should also reflect the probability of remaining unemployed. This can be incorporated straightforwardly in our model by setting the benchmark wage for the private sector W^e equal to V_g , or the expected utility of being employed in the other sector. Recalling that

$$V_g = (1 - s_g) W_g + s_g V_u$$

that V_u can be written as $V_u = \frac{s_g L_g}{U} V_g + \frac{s_p L_p}{U} V_p$ and that at equilibrium $V_p = V_g$, then

$$\frac{W_p}{V_g} = \frac{1 - (1+s_g^2) L_g - (1+s_g s_p) L_p}{(1-s_g)(1 - L_g - L_p)} \frac{W_p}{W_g} \quad (11)$$

$$\text{or} \quad \frac{W_p}{V_g} = \frac{U - s_g (s_g L_g + s_p (1 - L_g - U))}{(1-s_g) U} \frac{W_p}{W_g} \quad (11')$$

⁶Although a labor-augmenting effort function is conventional in the efficiency wage literature, it is essentially an arbitrary assumption. Weiss (1991) provides a plausible intuition justifying this assumption.

Thus, the general effort function $\psi(W_p/V_g)$ with $\psi' > 0$ and $\psi'' < 0$ takes the form

$$\psi(W_p, W_g, L_g, U) \quad (12)$$

This general functional form has a number of attractive properties. It can easily be demonstrated that:

$$\frac{\partial \psi}{\partial W_p} > 0 \quad (13)$$

$$\frac{\partial \psi}{\partial W_g} < 0 \quad (14)$$

$$\frac{\partial \psi}{\partial L_g} < 0 \quad \text{if } s_p > s_g \quad (15)$$

$$\frac{\partial \psi}{\partial U} > 0 \quad (16)$$

A standard result of the efficiency wage literature is that, with a labor-augmenting effort function such as ψ , private firm optimum is reached when the elasticity of the effort function with respect to the wage is equal to one, the so-called "Solow condition" (Solow 1979; Weiss 1991; Layard *et al.* 1991). Substituting (11) for W_p/V_g and setting the elasticity of ψ with respect to W_p equal to one yields

$$W_p = \frac{(1-s_g)(1-L_g-L_p)W_g\psi}{(1-(1+s_g^2)L_g-(1+s_p s_g)L_p)\psi'} \quad (17)$$

or equivalently, recalling that $L_g + L_p + U = 1$

$$W_p = \frac{(1-s_g)UW_g\psi}{(U-s_g(s_g L_g + s_p(1-L_g-U)))\psi'} \quad (17')$$

This expression is the second key relationship of the model. It describes the optimizing private firms' reaction function to the government's decisions about L_g , W_g . For any given level of L_g and W_g , equation (17') together with the labor market equilibrium condition (7) determine equilibrium in this economy in terms of L_g , W_g and U .

The private sector equilibrium condition can also be expressed in terms of the wage differential W_p/W_g if we divide both sides of (17) or (17') by W_g . We can then use this form jointly with the labor market equilibrium condition to derive an expression for L_p or U . The value of L_p at equilibrium is given by:

$$L_p = \frac{\psi' (1 - (1+s_g s_p) L_g) - \psi (1 - (1-s_p) L_g - s_p)}{\psi' (1+s_p^2) - \psi (1-s_p)} \quad (18)$$

For equilibrium L_p to be positive and less than one (since it is the share of private sector employment to total labor force), the following condition must be satisfied:

$$\frac{\psi'}{\psi} > \frac{1 - s_p}{1 + s_p^2} \quad (19)$$

The unemployment rate at equilibrium is given by:

$$U = \frac{s_p (s_g L_g + s_p (1-L_g)) \psi'}{\psi' (1+s_p^2) - \psi (1-s_p)} \quad (20)$$

which is always positive if condition (19) is satisfied. A more important question, however, is whether unemployment at equilibrium is greater than the frictional level $s_g L_g + s_p L_p$. To assess this, we calculate the value of the probability of remaining unemployed for more than one period $q = 1 - \alpha_g - \alpha_p$ using (4) and the equilibrium values of L_p and U .

$$q = \frac{\psi' (U(1+s_p^2) - s_p(1-L_g) - s_g L_g) - \psi (1-s_p) (U - s_p(1-L_g) - s_g L_g)}{U (\psi' (1+s_p^2) - \psi (1-s_p))} \quad (21)$$

It can be shown that a sufficient (but not necessary) condition for $q > 0$ is (19). This demonstrates how in our model a labor-augmenting effort function in the private sector generates, under certain conditions, an equilibrium with long-term unemployment (and thus a positive wage differential).

Condition (19) expresses a simple intuition. The left-hand side ψ'/ψ can be loosely interpreted as the degree of "responsiveness" of the effort function to the relative wage, while the ratio on the right-hand side $1-s_p / 1+s_p^2$ is an inverse measure of the "riskiness" of private sector employment (the higher the separation rate s_p , which measures the probability of losing one's job in each period, the lower this ratio). If effort is relatively unresponsive to the relative wage and, at the same time, the risk associated with holding a private sector job is low (and the ratio $1-s_p / 1+s_p^2$ relatively high), it will not pay private sector employers to raise the

wage premium in order to motivate and retain workers: private firm optimum, with the elasticity of the effort function equal to one, will be achieved at a relatively low W_p , and unemployment in the economy will be minimized. If, on the other hand, effort is very responsive to the wage and, at the same time, private sector employment is risky (so that inequality (19) is satisfied), private sector optimum will be achieved at a relatively high wage premium, which adequately compensates and motivates workers. Consequently, long-term unemployment will be present at equilibrium.

Expression (17) describes the private employers' reaction function to the government's wage and employment decisions and, together with the labor market equilibrium condition, permits a full representation of the equilibrium in terms of L_g , W_g , as well as the characterization of the conditions for long-term unemployment. Nevertheless, expressions (18) and (20) for the equilibrium values of L_p and U , respectively, are somewhat cumbersome because they include the general terms ψ and ψ' . By way of illustration, we can also solve the model postulating a specific functional form for the effort function. We choose the form

$$\psi = \ln\left(\frac{W_g}{V_g}\right) + \gamma, \quad \gamma \geq 0 \quad (22)$$

which satisfies $\psi' > 0$, $\psi'' < 0$, and properties (13) through (16). Setting the elasticity of ψ with respect to W_p equal to one and solving for W_p we obtain the private sector reaction function

$$W_p = \frac{e^{1-\gamma} (1 - s_g) U W_g}{U - s_g (s_g L_g + s_p (1 - L_g - U))} \quad (23)$$

Diving both sides of (23) by W_g yields an equivalent expression in terms of the wage differential W_p/W_g which, because $\partial(W_p/W_g)/\partial U < 0$, allows a simple graphical representation of equilibrium as in Figure 1, where LL depicts the labor market equilibrium condition and RR the private sector reaction function. At equilibrium, the values of L_p and U are

$$L_p = \frac{e^\gamma (1 - L_g (1 + s_p s_g)) - e (1 - L_g) (1 - s_p)}{e^\gamma (1 + s_p^2) - e (1 - s_p)} \quad (24)$$

$$U = \frac{e^{1-\gamma} s_p (s_g L_g + s_p (1 - L_g))}{e^\gamma (1 + s_p^2) - e (1 - s_p)} \quad (25)$$

which are positive as long as

$$\frac{1 + s_p^2}{1 - s_p} > e^{1-\gamma} \quad (26)$$

This condition is satisfied if s_p and γ are “sufficiently large” (and it is always satisfied if $\gamma \geq 1$). With this specification of the effort function, as long as (26) is satisfied and $s_p > s_g$, then $0 < \partial L_p / \partial L_g < 1$ and $\partial U / \partial L_g < 0$. In other words, an increase in government employment reduces private sector employment by less than one-for-one, and thus reduces total unemployment. This result, however, depends crucially on model specification and the size of s_p and γ . This conclusion is in line with the findings of Boadway *et al.* (1988), who examine the impact of government hiring in a segmented labor market and conclude that, depending on the specification of the model, an expansion in government employment may or may not reduce unemployment. Moreover, it confirms the insight derived from the discussion of the labor market that, even if the net result of an increase in L_g is a decline in U , government hiring is generally not an effective instrument in lowering unemployment. It should be stressed that this conclusion arises solely from the microeconomic structure of our model, and stands independently of any macroeconomic impact that an expansion in government employment might additionally have on the economy.

C. The Government Sector

The discussion so far has covered the two essential elements of our model: equilibrium is characterized by the labor market equilibrium condition (7) and the private sector reaction function (17), which together determine L_p , W_p , and U expressed in terms of L_g , W_g , and the model parameters. This provides sufficient analytical structure for achieving what we set out to do: exploring the impact of government employment and wage decisions on the private sector and on the labor market. How exactly these decisions are made does not matter for our results. Nevertheless, in this section we provide an illustration of how the model could be closed by modeling explicitly the determination of L_g and W_g in the government sector.

To do this, some additional structure is necessary. We assume that the government is producing a public good or service G according to a simple production function $G = L_g^\alpha$ ($0 < \alpha < 1$), which is used as an input in the production of the private good $Y = K(\psi L_p)^\beta G^{1-\beta}$ ($0 < \beta < 1$), where K is a scale variable and ψL_p is the labor input in terms of “efficiency units”. The general idea, as in Barro (1990), is that private inputs are not perfect substitutes for

public inputs, such as infrastructure, defense, and security.⁷ The government collects lump-sum taxes T in order to finance its wage bill $W_g L_g$.⁸ The budget constraint is

$$W_g L_g = T \quad (27)$$

The government chooses W_g and L_g to maximize a general objective function of wages in the public sector and private sector output

$$W_g^\theta Y^{1-\theta}, \quad 0 \leq \theta \leq 1 \quad (28)$$

where θ can be thought of as a measure of the government's populist tendencies. When θ is close to one, the government places a great weight on increasing the wages of public sector workers, either as a result of pressures by public sector unions or in an effort to ensure electoral support. Conversely, when θ is close to zero, the government acts predominantly in the public interest; in the limiting case when $\theta = 0$, the government is maximizing a conventional social welfare function using private sector income as a proxy. Although one can envisage more sophisticated and realistic economies, this simple framework is sufficient for our illustration.

For tractability, we will use in this section the specific functional form (22) for the effort function in the private sector. Using the equilibrium value of L_p from (24), we maximize (28) with respect to W_g, L_g subject to the budget constraint (27), and solve the first-order conditions to obtain

$$L_g = \frac{[e^\gamma - e(1-s_p)] [\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]}{[e^\gamma (1+s_p s_g) - e(1-s_p)] [2\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]} \quad (29)$$

$$W_g = \frac{T [e^\gamma (1+s_p s_g) - e(1-s_p)] [2\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]}{[e^\gamma - e(1-s_p)] [\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]} \quad (30)$$

⁷This does not imply that the private sector cannot produce the public input. As Barro points out, as long as the government and the private sector have the same production function, the results would be the same if the private sector produced the public good and sold it to the government, which in turn provided it as input to the private sector.

⁸ We assume for simplicity that there are no collection costs. The model can be easily modified to allow for (non-distortionary) collection costs cT , in which case the budget constraint would be $W_g L_g = (1 - c)T$.

L_g and W_g are positive and L_g is less than one (since it is the share of government employment in total labor force) as long as the following—sufficient but not necessary—conditions are satisfied:

$$\frac{1}{1-s_p} > e^{1-\gamma} \quad (31)$$

$$\text{and } \alpha + \beta(1-\alpha) > \frac{\theta}{1-\theta} \quad (32)$$

Note that condition (31) is a “stronger” version of condition (26), and is satisfied for “sufficiently large” values of s_p and γ (and is always satisfied for γ equal to or greater than one). At equilibrium, total unemployment is

$$U = e^\gamma s_p \frac{s_p A \alpha(1-\theta) + s_g B [\alpha(1-\theta)(1-\beta) + \beta(1-\theta) - \theta]}{A B [2\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]} \quad (33)$$

and long-term unemployment, calculated as $LTU = U - s_g L_g - s_p L_p$ using the equilibrium values of U , L_g , and L_p , is

$$LTU = (e^\gamma - e)(1-s_p) \frac{s_p A \alpha(1-\theta) + s_g B [\alpha(1-\theta)(1-\beta) + \beta(1-\theta) - \theta]}{A B [2\alpha(1-\theta) + \beta(1-\alpha)(1-\theta) - \theta]} \quad (34)$$

$$\text{with } A \equiv e^\gamma (1+s_g s_p) - e (1-s_p) \quad \text{and} \quad B \equiv e^\gamma (1+s_p s^2) - e (1-s_p)$$

Not surprisingly, in this model specification an increase in θ (which measures the populist tendencies of the government) tends to lower L_g and to increase long-term unemployment, total unemployment, and the wage differential at equilibrium.

IV. EMPIRICAL ANALYSIS: THE CASE OF GREECE

Greece is prime material for an examination of the effects of the government on the labor market. In recent years, the central government has been keeping on its payroll 8–9 percent of the total labor force on average; this share rises to over 12 percent if public enterprises are included, and to 13 percent if state-owned banks are included. This share has risen substantially over time, almost doubling from its level in the 1960s, at the expense of private sector employment. More importantly from our point of view, since the mid-1970s, the

increase in the share of government employment has been associated with a steady decline in overall labor market performance, indicated by the increase in the unemployment rate from some 2 percent in 1975 to 10 percent in 1994 (Figure 2). (A more detailed discussion of overall labor market performance in Greece can be found in Demekas & Kontolemis 1996; for an analysis of the changes in policy regimes in Greece during the 1970s and 1980s and their macroeconomic impact, see Alogoskoufis 1995).

After the end in 1974 of the seven-year military dictatorship, which had suppressed union activity, wages shot up in both the government and the private sector; growth in the latter, however, surpassed that in the former, leading to a widening of the differential between the two. In the 1980s, under the socialist administration, this trend was partly reversed, only to resume again in the early 1990s. Aside from the level of remuneration, employment conditions in the two sectors are very different, with government employees enjoying constitutionally-guaranteed life employment, much more lax working conditions, and a generous pension system, including favorable early retirement provisions. For these reasons, government employment has traditionally been—and to a large extent still is—very desirable.

Figure 3 plots the wage differential W_p/W_g against unemployment. A positive correlation is strikingly apparent, as predicted by our model (equation 6). While this is not a formal test, it strongly suggests that our model may be relevant in explaining labor market aggregates in Greece. This is indeed corroborated by the results of more rigorous testing below.

In our empirical analysis, we use quarterly OECD data for Greece for the period 1970 to 1993. A major handicap is that the available data on government wages do not capture a number of side benefits associated with government employment, such as various extra payments (“productivity” bonuses, routinely paid to all civil servants; compensation for participating in various “committees” and working groups, even if these are part of the employee’s regular duties; hardship allowances, awarded to the majority of government employees; special “library bonuses” for those in research-related activities; etc.), as well as better pension, sickness, and leave benefits, lax working conditions (which allow civil servants to shirk and/or hold second jobs), and other advantages (potential for rent-seeking and corruption, etc.). All these benefits have a bearing on worker flows between sectors, and therefore on labor market equilibrium. To capture some of the various cash benefits paid to civil servants but not classified as wages in the official statistics, we calculate the government wage as the ratio of the government wage bill to government employment. But although this is an improvement over the official government wage data, several benefits are still not captured. This helps explain why our calculated government wage is lower than the actual wage in the private sector for part of the sample period, even when unemployment is high and rising.

A. The Evidence from Length of Job Tenure

The labor market equilibrium condition (6) expresses the W_p/W_g differential in terms of unemployment, employment in the private and government sectors, and the separation rates in

the private and government sectors (s_p and s_g). The latter are supposed to be exogenous. It should thus be possible to use actual data on unemployment and sectoral employment levels to obtain the values of exogenous s_p and s_g for which (6) predicts a public-private wage differential that is consistent with the data. Although separation rates are not directly observable, length of job tenure is, and there is some information in OECD (1997) about length of job tenure in Greece. The relationship between separation rates s_i ($i = p, g$) and length of job tenure d_i in quarters is given by:

$$d_i = 1/[1-(1-s_i)] , \quad i = p, g \quad (35)$$

where $(1-s_i)$ is the probability of remaining in employment in sector i during any given quarter. Expression (35) describes the mean of a random variable with a geometric distribution, often referred to as a waiting-time random variable.

Our approach is the following. We use data on sectoral employment levels and unemployment to calculate the numerical values of s_p and s_g that minimize the deviation between the value of W_p/W_g obtained from equation (6) and the actual wage differential. Since W_p/W_g fluctuates significantly throughout the sample, we divide the sample in three sub-periods depending on whether W_p/W_g is greater or lower than one: these are 1970:1–1980:4 ($W_p/W_g < 1$); 1981:1–1989:2 ($W_p/W_g > 1$); and 1989:3–1993:4 ($W_p/W_g < 1$). We use a simple mean-squared error (MSE) criterion, and minimize the average MSE of the three sub-periods weighted by the number of observations in each. We search for the minimum over a range of pairs of numerical values for s_p and s_g that correspond to job tenure in the government sector between 5 and 20 years, and in the private sector between 3 and 8 years. In total, 1281 pairs of s_p and s_g are examined.

The values of s_p and s_g that minimize the MSE criterion are 0.066 and 0.022, respectively, and these imply, according to (35), average length of job tenure of 3.8 years in the private sector and 11.3 years in the government sector. Table 1 compares these results with data on average job tenure in Greece from OECD (1997). Although the estimates of length of job tenure implied by our model are somewhat shorter in both sectors than those suggested by the OECD study, the estimated differential between the length of tenure in the private and government sectors (about 8 years) is very close to the actual.

Table 1: Average length of job tenure in Greece, in years

Actual (OECD 1997)	Public administration	Public utilities	Financial inter-mediation ¹	Wholesale and retail trade	Real estate, renting and business activities	Hotels and restaurants
	13.9	13.2	11.3	6.4	5.8	5.8
Estimated	Government			Private sector		
	11.3			3.8		

¹ In Greece, the bulk of employment in the financial sector is in state-owned banks, with conditions very similar to those in the public administration.

B. Econometric Analysis

In addition to the empirical support indirectly adduced by the evidence on length of job tenure, we use a vector auto-regression (VAR) technique to test formally for the existence of the long-term relationships and restrictions implied by our model. In the spirit of Johansen (1988a and 1988b), we begin by estimating an unrestricted VAR system of the main variables of our model. The solution of this system is a matrix (Π), which can be partitioned into two, one giving us the coefficients of the long-run co-integrating vectors (the β -matrix), and a second with the impact coefficients (α). In general, the VAR system takes the form

$$y_t = \sum_{i=1}^m \pi_i y_{t-i} + v_t$$

which can be written in the error-correction form as

$$\Delta y_t = \sum_{i=1}^{m-1} \delta_i \Delta y_{t-i} + \alpha(\beta' y_{t-1}) + v_t$$

only if $\alpha\beta'y_{t-1}$ is $I(0)$; in other words, if there exists at least one co-integrating vector between the variables in y_t . The term $\alpha\beta'y_{t-1}$ is a vector of error-correction terms. The impact coefficients (α) measure the extent of any short-run adjustment, or the responsiveness of changes in the variables to the error-correction terms. The rank of the matrix—which determines how many co-integrating relationships exist—is determined on the basis of formal testing, and is then imposed, which in turn implies a new set of matrices corresponding to the reduced-rank long-run matrix.

The VAR system we estimate takes the following form:

$$y_t = (W_p, W_g, U, L_g)_t \quad (36)$$

where W_p and W_g are the (log) real wages (deflated by consumer prices) in the private and government sectors, respectively, and U and L_g are unemployment and government employment as shares of total labor force. The estimation period, chosen on the basis of data availability, is 1971:1–1993:4. Six lags of each variable are included in the system; the choice of the number of lags was made on the basis of conventional F-tests for retained regressors. Tests for unit roots show that all variables are difference-stationary, or $I(1)$. The various diagnostic tests indicate a well-specified system with no statistical problem; the residuals are homoskedastic, no autocorrelation is present, and normality is a good approximation of their distribution.

The tests for co-integration are the standard tests proposed by Johansen (1988a, 1988b); see also Doornik & Hendry (1994). It appears that there are two large (significant) eigenvalues suggesting that there exist two co-integrating relationships (Table 2). The formal tests—trace

and maximum eigenvalue statistics, reported in Table 2—confirm the existence of two co-integrating vectors, and so we proceed with the hypothesis that the rank of Π is 2. Table 2 shows the standardized co-integrating vectors and feedback coefficient (full-rank) matrix. Each row of the standardized beta eigenvector matrix, normalized on the diagonal, reports the co-integrating vector that spans the co-integrating space. It is important to note that this is just one representation of the co-integrating space, and that any linear combination is also admissible. The next step therefore is to try to identify unique long-run relationships that are consistent with our model.

Table 2. Greece: Co-integration analysis 1971QI to 1993QIV

Ho: rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	33.97**	25.11	28.1	77.08**	56.97*	53.1
p <= 1	24.89*	18.39	22.0	43.11**	31.86	34.9
p <= 2	11.85	8.758	15.7	18.22	13.47	20.0
p <= 3	6.371	4.709	9.2	6.371	4.709	9.2

standardized \beta' eigenvectors					
	LRWp	LRWg	U/Lf	Lg/Lf	Constant
	1.0000	-2.8146	0.029174	0.11899	-0.77332
	-0.19268	1.0000	0.036679	-0.15757	0.93829
	-7.0068	34.195	1.0000	-9.8866	79.109
	99.699	-117.62	-0.76457	1.0000	7.1660

standardized \alpha coefficients				
	LRWp	LRWg	U/Lf	Lg/Lf
	0.021175	-0.10669	0.00026450	-0.00061099
	0.058759	-0.064145	-0.00025972	0.00013962
	-0.27723	-0.10279	0.0012307	0.0013030
	0.092206	0.027025	0.0017825	8.3992e-005

long-run matrix Po=\alpha*\beta', rank 4					
	LRWp	LRWg	U/Lf	Lg/Lf	Constant
LRWp	-0.021037	-0.085377	-0.0025638	0.016105	-0.099935
LRWg	0.086858	-0.25483	-0.0010050	0.019806	-0.12517
U/Lf	-0.13614	0.56632	-0.011623	-0.027656	0.22464
Lg/Lf	0.082884	-0.18142	0.0053995	-0.010825	0.095664

Number of lags used in the analysis: 6

Variables entered unrestricted:

CSeason_1 CSeason CSeason_2

Variables entered restricted:

Constant

The model is summarized by two key relationships: (7) characterizing labor market equilibrium, and (17) describing the adjustment of private sector wages. In terms of our VAR system, two relationships should then hold: one between W_p/W_g , U , and L_g , and one between W_p , W_g , U , and L_g . The first implies the specific restrictions (1, -1, *, *) on the first co-integrating vector. Furthermore, according to our theoretical model, there are additional restrictions to be imposed in the α (adjustment) coefficients. These are necessary to identify unique cointegrating vectors, and are testable. The first implication of the model is weak exogeneity of L_g and W_g to the decision-making process in the private sector, and the second that W_g does not adjust to deviations in the labor market equilibrium, that is, it is weakly

exogenous for the parameters of this long-run relationship. These imply the following restrictions on the α matrix :

$$\alpha' = \begin{bmatrix} * & * & * & 0 \\ * & 0 & * & 0 \end{bmatrix}$$

The likelihood ratio test for the over-identifying restrictions for rank=2 is $\text{Chi}^2(3) = 7.6049$ [0.0549]. The two co-integrating relationships and the α matrix are given by:

$$\begin{aligned} CI_1 &: (W_p - W_g) = 0.52 U - 4.11 \\ CI_2 &: W_p = 2.96 W_g + 0.003 U - 0.19 L_g + 1.13 \end{aligned} \quad (37)$$

The coefficients provided by the restricted matrices are consistent with the predictions of the theoretical model. Unemployment is positively correlated with the wage differential, as suggested by Figure 3 (the parameter of L_g in the first co-integrating relationship is not significantly different than zero and has been omitted); and an increase in government wages leads to a proportionately higher increase in private sector wages and, therefore, higher unemployment and a higher private-public sector wage differential. In addition, the restrictions in the α (adjustment) matrix, which are not rejected, are also consistent with the model.

The estimated parameters of the feedback matrix can also provide information about the speed of adjustment of the VAR system to a shock away from equilibrium. The estimates suggest that the adjustment of wages to disequilibria is slow compared to adjustments in the unemployment rate. The speed of adjustment of private sector wages to CI_1 and CI_2 is about 0.4 percent and 5.5 percent per quarter, respectively. The latter implies a half-life of 13 quarters (i.e., about fifty percent of the disequilibrium is closed in the first year). On the other hand, the adjustment speed of unemployment implied by CI_2 is rather high: 23 percent a quarter, implying a half-life of just 3 quarters.

Table 3. Greece: Restricted model, 1971QI to 1993QIV

SYS(151) General cointegration test 1971 (1) to 1993 (4)

\beta'					
	LRWp	LRWg	U/Lf	Lg/Lf	Constant
	1.0000	-1.0000	-0.52258	0.00000	4.1116
	1.0000	-2.9654	-0.0034340	0.18914	-1.1396
Standard errors of beta'					
	LRWp	LRWg	U/Lf	Lg/Lf	Constant
	0.00000	0.00000	0.14701	0.00000	0.94186
	0.00000	0.35089	0.011263	0.057701	0.43941
\alpha					
	LRWp	LRWg	U/Lf	Lg/Lf	
			0.0043354	0.055700	
			0.00000	0.084425	
			0.017765	-0.23414	
			0.00000	0.00000	
Standard errors of alpha					
	LRWp	LRWg	U/Lf	Lg/Lf	
			0.0019950	0.033595	
			0.00000	0.018055	
			0.0050546	0.077433	
			0.00000	0.00000	
Restricted long-run matrix $Po = \alpha * \beta'$, rank 2					
	LRWp	LRWg	U/Lf	Lg/Lf	Constant
LRWp	0.060035	-0.16951	-0.0024568	0.010535	-0.045651
LRWg	0.084425	-0.25035	-0.00028991	0.015968	-0.096211
U/Lf	-0.21638	0.67655	-0.0084795	-0.044286	0.33987
Lg/Lf	0.00000	0.00000	0.00000	0.00000	0.00000
Long-run matrix of first differences \Gamma					
	LRWp	LRWg	U/Lf	Lg/Lf	
	1.3413	-0.68691	-0.049674	0.042687	
	0.22988	-0.044030	-0.024431	0.087616	
	-0.31044	2.2869	0.16807	0.11660	
	-0.62283	-0.47941	0.021417	0.37832	
Moving average impact matrix					
	LRWp	LRWg	U/Lf	Lg/Lf	
	3.8235	-5.1104	-0.93308	1.9014	
	1.8197	-2.4321	-0.44407	1.0902	
	3.8345	-5.1250	-0.93576	1.5524	
	8.3834	-11.205	-2.0459	7.0672	

loglik = 1394.7308 -log|\Omega| = 30.320235 unrestr. loglik = 1398.5332
 LR-test, rank=2: $\chi^2(3) = 7.6049$ [0.0549]

V. CONCLUSIONS

The government has a significant presence in the labor market. In most countries, it employs a large and growing number of workers, and it treats them (and pays them) very differently than private sector employers treat and pay their workers. In addition, its employment and wage decisions are made in a fundamentally different way than those of private sector employers, and are probably affected to a significant extent by political considerations. Rational optimizing workers and private sector employers are bound to take the government decisions into account when making decisions about job search, wages, and employment. These facts suggest that understanding the mechanism and the impact of the government's decisions as an employer is important for understanding aggregate labor market performance, especially in countries with a pervasive public sector.

We have developed a simple two-sector model of the labor market with endogenous unemployment that incorporates these stylized facts and allows us to trace the interplay between the employment and wage decisions of the government and overall labor market performance. The model shows that government wage and employment decisions have a profound—and potentially perverse—impact on the labor market. Increases in government wages lead through worker flow dynamics to increases in private sector wages and, therefore, directly to higher unemployment. Increases in government employment do not have a significant impact on unemployment, and might even raise it. Using data for Greece, where the public sector has a significant and rising share of employment, we have found strong support for the model's theoretical predictions.

Specifically, it appears that the expansion of the public sector in Greece during the late 1970s and 1980s not only failed to improve overall labor market performance, but has probably contributed directly to its sharp deterioration during that period. Increases in government wages (and benefits), in particular, have had a strong positive impact on private sector wages and led to higher unemployment. At the same time, because of its positive impact on private sector wages, the expansion of government employment has been much less effective in relieving the burden of unemployment than policy-makers probably thought at the time. Looking ahead, the policy conclusion is twofold. First, in evaluating the impact of government action on the labor market and the economy more broadly, the effects of wages, employment, and the level of output (public services) must be considered together, not separately. And second, government wage restraint has an important role to play in reducing real wage resistance and unemployment.

While our empirical results are strong, they should be treated with caution. Our analytical framework does not purport fully to explain the phenomenon of unemployment, but simply to model one aspect of the labor market which has been overlooked: namely, the effects of the government's decisions as an employer. This aspect is important in some countries, but may well be relatively unimportant in others, which have a small and efficient public sector. Furthermore, the model is very simple: first, it lacks explicit dynamics, and thus does not take incorporate the phenomenon of hysteresis, for which there is significant empirical support; and

second, it ignores the macroeconomic effects of government spending (and deficit) on private sector demand for labor including through the level of the interest rate. These are promising areas for future research.

Figure 1: Equilibrium (specific effort function)

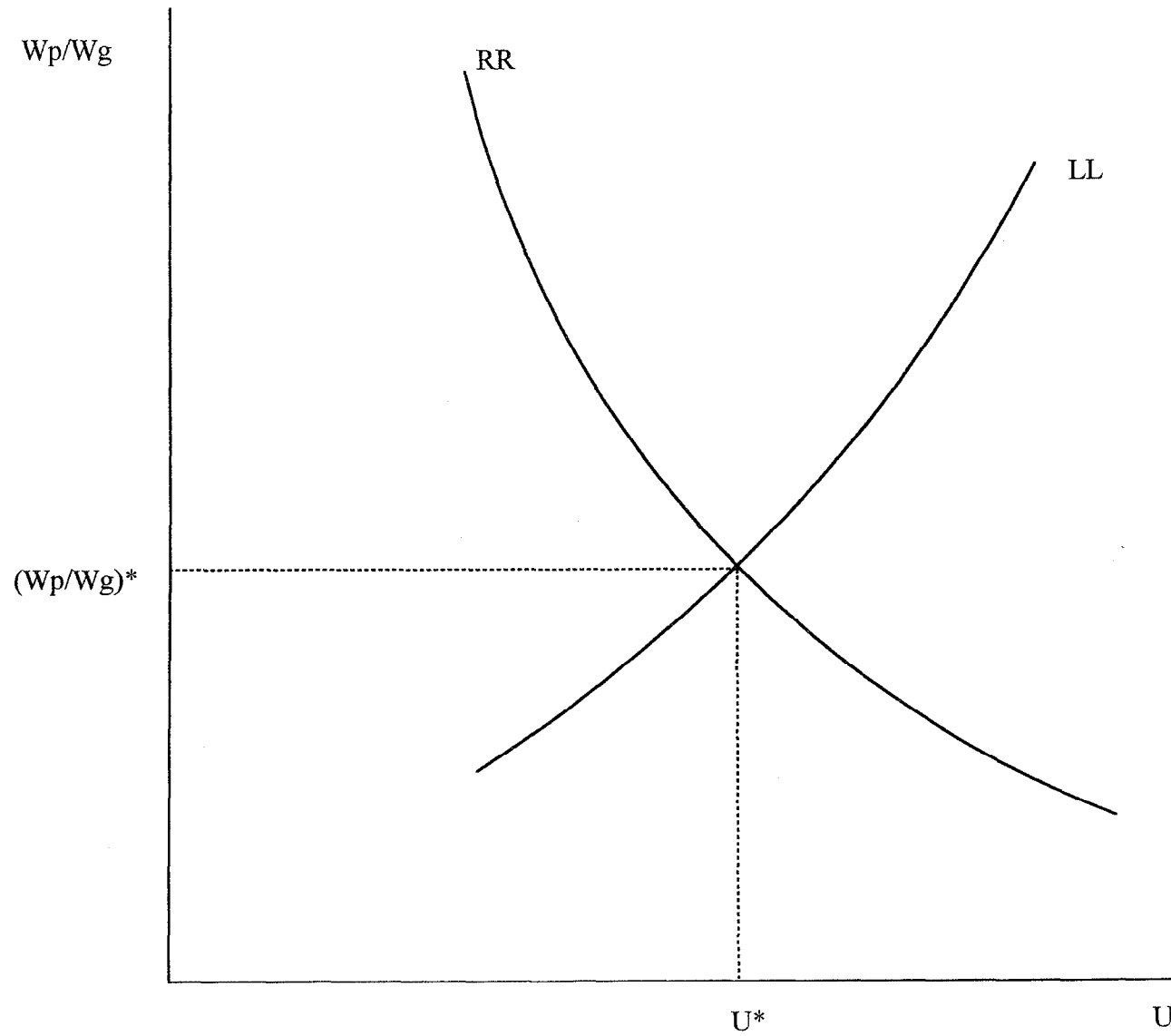
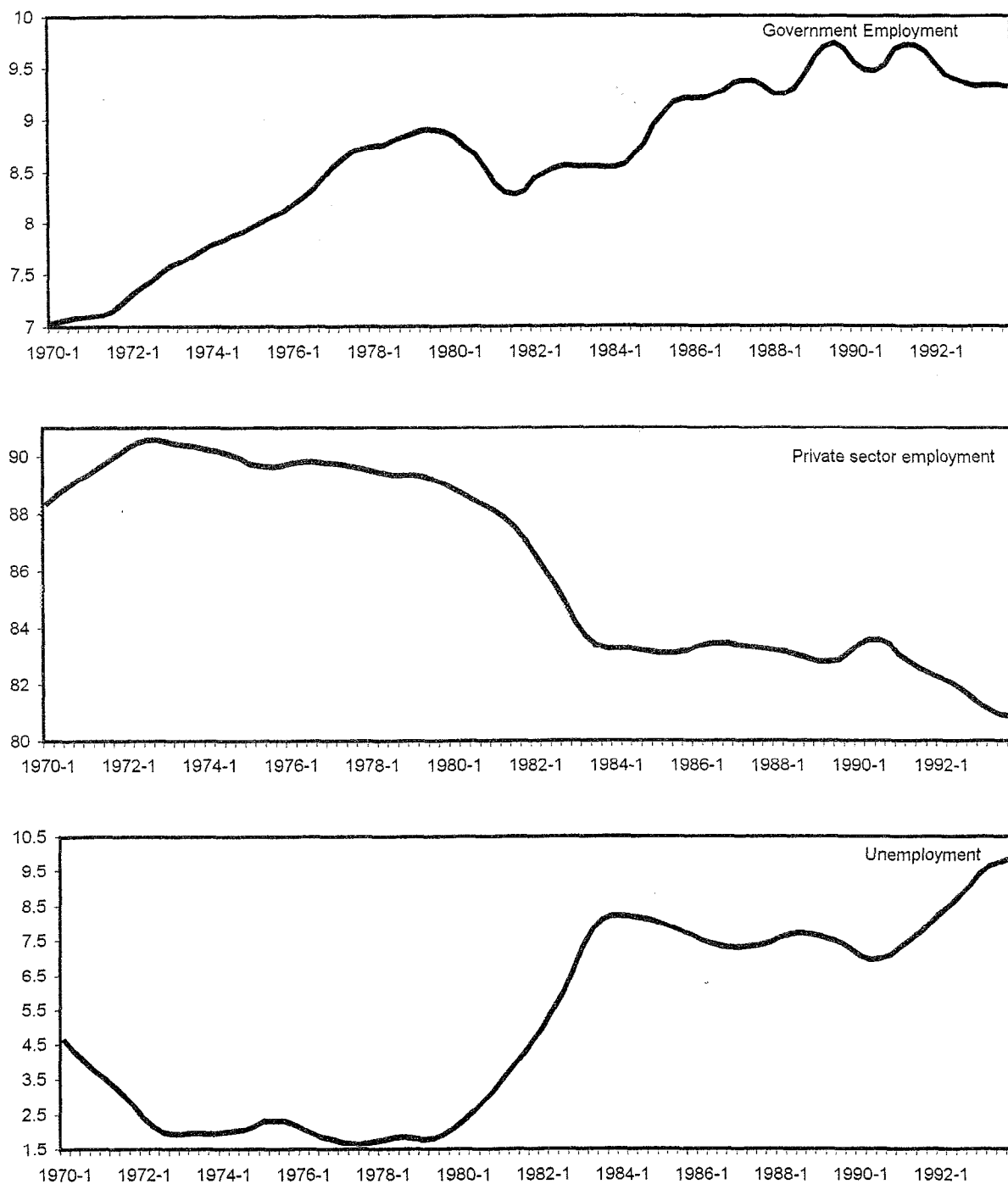
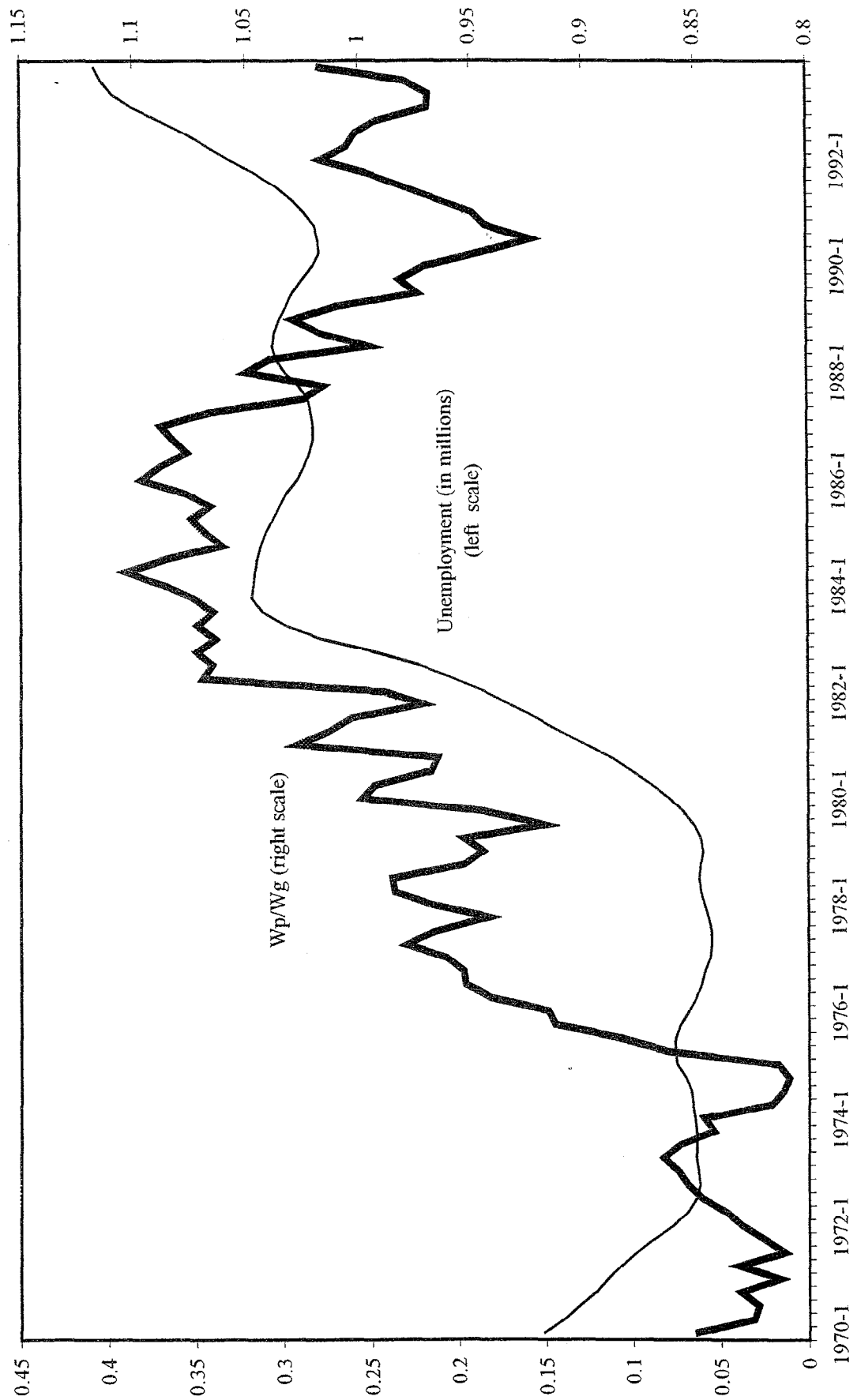


Figure 2. Greece: Employment and Unemployment
(in percent of the labor force)



Sources: OECD

Figure 3. Greece: Wage Differential and Unemployment



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