GOVERNMENT EMPLOYMENT AND UNEMPLOYMENT: WITH ONE HAND GIVETH, THE OTHER TAKETH

Jim Malley

Thomas Moutos

May 1998

Abstract: The relationship between unemployment, real wages and government employment is examined to determine the nature of the transmission mechanism and the extent to which private employment is crowded-out by government employment. We find in Germany, Japan and the U.S. that there is full crowding-out (i.e. unemployment is not affected by changes in government employment). According to traditional theory, the fall in private employment results from the rise in real wages that increases in government employment generate. Our findings cast doubt on the relevance of such a transmission mechanism. We instead attribute the fall in private employment to the increased disincentives for firm and job creation which are associated with increases in government employment.

Keywords: unemployment, government employment, crowding-out, job creation and destruction.

JEL Classification: E24, J68

Acknowledgements: We would like to thank Julia Darby, Mary Gregory, Chol-Won Li, Hassan Molana, Lee Redding, Andrew Stevenson and Euclid Tsakalotos for helpful comments and suggestions. The usual disclaimer applies.

Jim Malley, Department of Economics, University of Glasgow, Glasgow G12 8RT, UK, email: j.malley@socsci.gla.ac.uk.

Thomas Moutos, Department of International & European Economic Studies, Athens University of Economics & Business, 104-34 Athens, Greece, email: moutos@aueb.gr.

"Great nations are never impoverished by private, though they some-times are by public prodigality and misconduct". A. Smith (1776, p.306)

1. Introduction

In this paper we uncover some empirical regularities which may prove to be useful for unemployment policy evaluation. The most important of these is that both the level of unemployment and the unemployment rate are independent of innovations to the level of government employment in Germany, Japan and the United States. This implies that the crowding-out of private employment by government employment is complete. We further find that this crowding out is not caused by the assumed decline in private employment resulting from the upward pressure on real wages generated by increases in government employment. We instead argue that the crowding out is a consequence of the reduction of incentives for economic activity in the private sector, which is engendered by increases in public employment. We demonstrate these empirical regularities by modelling dynamic interrelationships between aggregate time-series on unemployment, real wages and government employment for Germany, Japan and the United States.

The conventional wisdom regarding the relationship between government employment and unemployment has been dominated by the view that governments can limit unemployment to low levels through expansion of public sector employment. For example, Lindbeck (1990) has argued that Sweden's enviable unemployment record in the 1970s and 1980s has in large part been due to the expansion of permanent public sector employment. In contrast, Malley and Moutos (1996) have demonstrated that this may not be an entirely valid explanation. According to the classical model, an exogenous increase in government employment will raise aggregate employment and

the real wage but private employment will fall (see, for example, Calmfors, 1994). The degree of this crowding-out of private employment by government employment will obviously depend on the slopes of both the aggregate labour demand and supply schedules (and the method of financing the increase in government employment). In addition, increases in government employment can "directly" displace private employment (e.g. public utilities, railways, hospitals, etc.). It is obvious that once indirect and direct crowding-out are taken into consideration, increases in government employment can result in a fall in aggregate employment. In other words, the crowding-out of private employment by government employment can be more than one for one. Malley and Moutos (*op cit*.) have demonstrated this case by examining quarterly Swedish data for the period 1964-1990. In this paper, we argue that government employment increases can additionally reduce the rate of firm and job creation and increase the rate of firm and job destruction in the private sector by reducing incentives (through higher taxes) and increasing the fixed costs of starting new firms (through bureaucratic regulation, rent seeking and corruption). Based on our empirical findings, we conclude that, that this latter effect is mainly responsible for the complete crowding-out of private employment by government employment in Germany, Japan and the United States.

The rest of the paper is organised as follows. Section 2 presents the theoretical background. Section 3 explains the econometric methodology employed including the choice and implementation of identifying restrictions. Section 4 presents and discusses the dynamic responses of the economy to real wage, unemployment and government employment shocks. In addition the robustness of these results to alternative

specifications and identifying restrictions is examined. In the final section we summarise the results and offer some concluding comments.

2. Theoretical Considerations

In this Section we first provide a general discussion of the (by now) traditional approach to modelling equilibrium unemployment. Second we present some arguments which we think should be used in conjunction with the traditional approach to allow for a more complete understanding of the ways in which the actions of governments may affect unemployment.

2.1 Traditional Theory

Our initial approach is informed by a model which allows for market power in both product and labour markets, and in which the number of firms in the economy is given. In this model, the equilibrium level of unemployment is determined by the requirement that the wage setting and price setting decisions of workers and firms generate a real wage rate acceptable to both parties. Given that there are many expositions of this model, we provide only a brief sketch of its main ingredients and then concentrate on the effects of changes in government employment (for more details see Layard, Nickell and Jackman (*op cit.*) and Lindbeck (1993)).

A crucial distinction in this model is between labour supply, which reflect decisions of individual households, and wage setting, which is performed by trade unions and/or firms. For simplicity, and in accordance with the empirical evidence that the income and substitution effects of changes in the real wage tend to offset each other, we assume that the labour supply (LS) curve in Figure 1 is vertical. The wage setting function relates the aggregate employment rate to the real wage rate. A positive

relationship between aggregate employment, at a given labour supply, and the real wage can be supported by a number of theories (i.e. firm-union bargaining, efficiency wage and insider-outsider theories). According to these theories, this result derives from the fact that workers can push up wages when the unemployment rate is low (since the probability of finding another job after losing one's job is high) or alternatively by the observation that firms offer high wages when the unemployment rate falls in order to limit shirking and quits by their employees. With these justifications, we can write the wage setting function as

$$W = S(N/L, A), \quad S_1>0 \tag{1}$$

where, W is the real wage rate, N is (aggregate) employment, L is the labour force, A represents a collection of variables which affect wage setting (i.e. productivity, unemployment benefits, labour market legislation, etc.) and, S_1 is the derivative of the wage setting function with respect to N/L. Inverting equation (1) we obtain a relationship between the aggregate employment rate and real wages

$$N/L = R(W, A), \quad R_1>0. \tag{2}$$

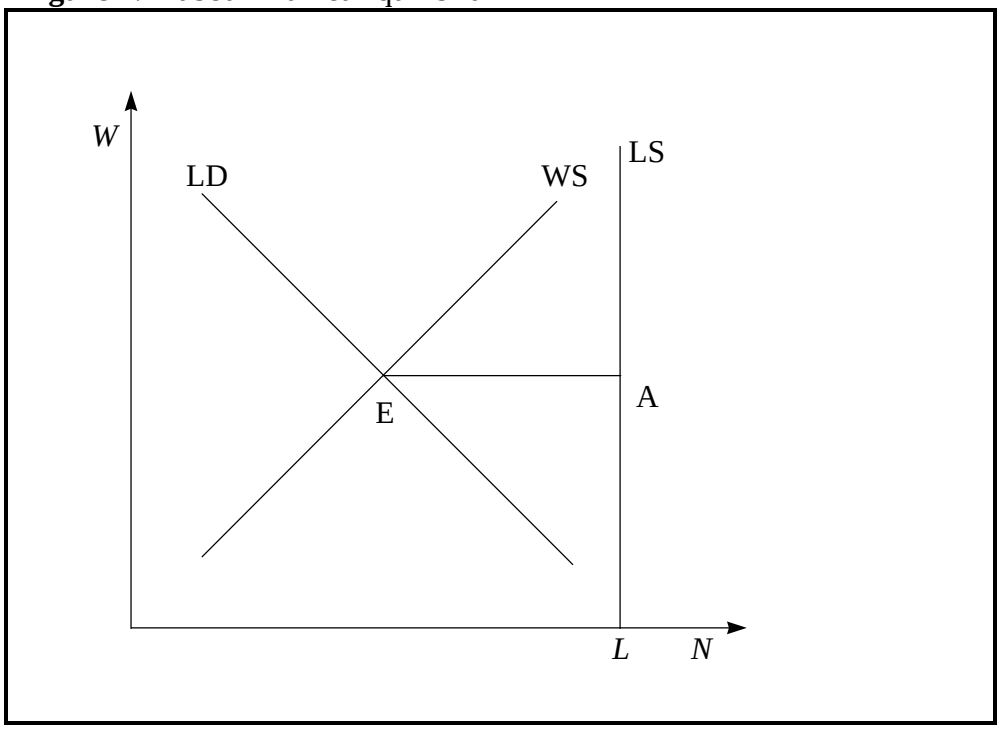
The wage setting function is shown in Figure 1 as the upward sloping WS curve. The downward sloping LD schedule depicts the optimum relationship for firms between the real wage and employment. Following Lindbeck (1993) we call this curve a labour demand relation rather than a labour demand curve, and assume that aggregation of the individual labour demand relations give rise to a macroeconomic relationship of the form

$$N = D(W, B), \quad D_1<0 \tag{3}$$

where, B represents a collection of variables which affect the employment decisions of firms (i.e. productivity, degree of competition in the product market, labour market legislation, etc.).

The intersection of the WS and LD curves in Figure 1 at point E determines the equilibrium employment level at which the wage and price setting behaviour of workers and firms result in a real wage (and a profit rate) which is acceptable to both parties. The difference between *N* and *L* determines the equilibrium level of unemployment, UN (=EA).

Figure 1. Labour Market Equilibrium



We now introduce the possibility of government employment. For simplicity we assume that private employment and government employment are considered to be perfect substitutes from the point of view of those supplying labour. This assumption rules out the existence of a dual labour market. We further assume that government employment N_G is determined by considerations regarding the desired size of the public sector, and is therefore independent of the real wage, and does not respond to the state of the labour market[1]. Denoting private sector employment by N_P, we can now rewrite the wage setting function as

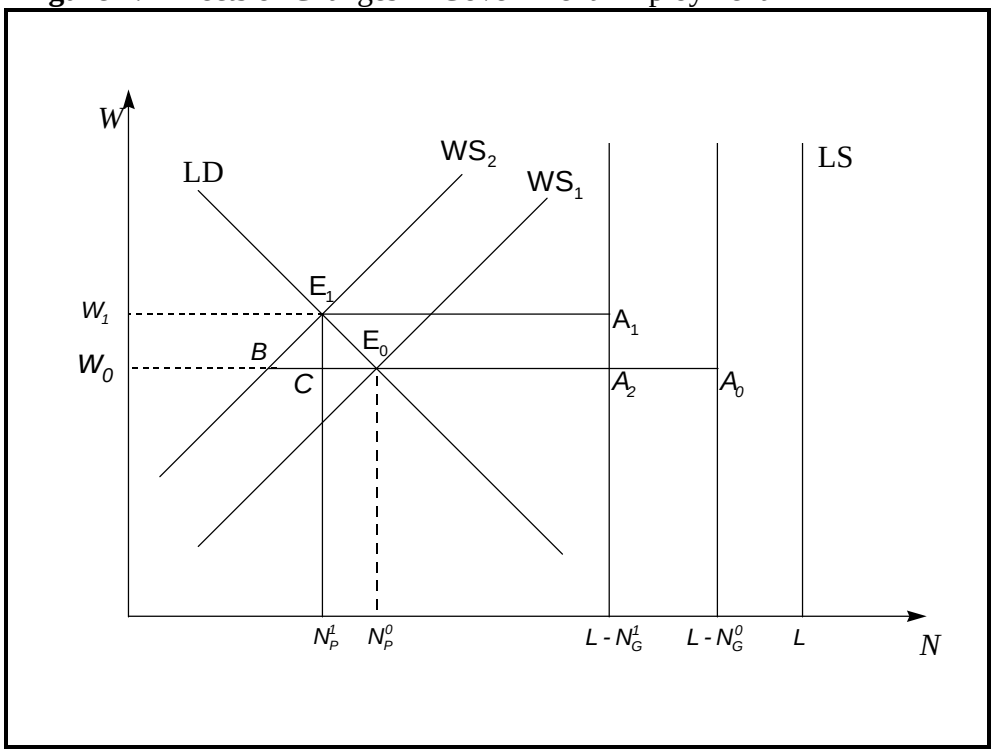
$$W = S\left(\frac{N_P + N_G}{L}, A\right), S_1 > 0 \qquad (4)$$

This function states that, *ceteris paribus*, an increase in government employment will enable workers to push up wages because the employment rate rises. In Figure 2, the consequences of changes in N_G are demonstrated. Initially, N_G^0 is the level of government employment, and N_P^0 is the level of private employment. Given our assumptions regarding the independence of both N_G and L of the real wage, the vertical line emanating from $L\text{-}N_G^0$ depicts the amount of labour which is available for hiring by the private sector. The distance E_0A_0 measures the equilibrium unemployment level. Now consider an increase in government employment. With L given, the vertical line at point $L\text{-}N_G^1$ is the "effective" labour supply to the private sector. The implied rise in the employment rate at every (unchanged) level of private employment makes economic agents revise their wage setting decisions upwards. According to equation (4), a rise in N_G must be associated with an equal fall in N_P, in order for workers (or firms) to be satisfied with their previous wage setting decision. In terms of Figure 2, the wage setting schedule shifts to the left by an amount equal to the rise in N_G (the distance A_2A_0 is equal to BE_0). As a result, the real wage rises to W_1 and private employment falls to N_P^1. The distance CE_0 measures the indirect crowding-out of private employment by government employment, whereas the distance BC measures the fall in unemployment, which is now equal to E_1A_1.

From the above analysis it is obvious that the slopes of the LD and WS curves are crucial for determining the extent of the fall in unemployment. The flatter the LD curve, the smaller will be the decrease in unemployment - in the case of a horizontal LD curve unemployment will stay constant - following an increase in government

employment. On the other hand, the steeper the WS curve, the larger will be the degree of indirect crowding-out of private employment (the smaller the decrease in unemployment) as a result of increases in N_G.

Figure 2: Effects of Changes in Government Employment



Recent research (see, for example, Blanchard and Summers, *op cit*. and Davis *et al*., 1996) has cast severe doubt as to the likely slope of these schedules (the LD curve could even be upward sloping). However, theoretical uncertainty is not only limited to the issue of relative slopes. An increase in government employment requires financing and usually necessitates increases in taxation. If higher taxes take the form of an increase in either the income tax or the sales tax rate, then the wage setting schedule would shift to the left as, for example, unions would try to offset the reduction in the after-tax wage rate by an increase in the wage rate paid by firms. Increases in payroll tax rates (necessitated by the need to finance a higher N_G) would be expected to shift both the WS schedule (for reasons similar to the one given earlier) and the LD curve to

the left. The leftward shift of the LD curve can be explained as the optimum response of a firm to a rise in the real product wage. In terms of Figure 2, the implications of these further shifts is that the intersection of the LD and WS curves can be to the left of point B. Hence, the crowding-out of private sector employment can be more than complete and accordingly unemployment may rise, rather than fall, in response to an increase in government employment.

Further complications with respect to the effects of government employment on unemployment are introduced by considerations regarding the nature of N_G. It may be the case that government employees produce services which substitute for the private provision - such as education, school lunch programmes, child care, fire and police services. In such cases government employment directly (and sometimes forcibly - as in the case of nationalisation or "socialisation" of privately owned utilities) displaces private employment, without (necessarily) having any effects on the real wage and the unemployment rate. There may also be cases in which the services produced by government employees are an input to private production processes. Examples of these are the provision of applied scientific research, of infrastructure and of a legal system that enforces private contracts.[2] Provision of these types of public services is likely to induce private firms to increase employment for any given real wage, thereby shifting the LD curve to the right and generating a "crowding-in" effect. Nevertheless, we now wish to argue that these beneficial effects may be dwarfed by the deleterious effects of rent-seeking and bureaucratic red tape that usually accompany the growth of government employment.

2.2 Alternative Channels of Influence

At least since the time of Smith (1776), economists have recognised the importance of keeping the share of national output that is appropriated by the public sector at a low level.

> *"The whole, or almost the whole public revenue, is in most countries employed in maintaining unproductive hands… Such people, as they themselves produce nothing, are all maintained by the produce of other men's labour… When multiplied, therefore, to an unnecessary number, they may in a particular year consume so great a share of this produce, so as not to leave a sufficiency for maintaining the productive labourers, who should reproduce it next year…"*
>
> (A. Smith, p.306)

It would obviously be wrong to identify, in today's world, the activities of the public sector as being unproductive. Johnston (1975) and Bacon and Eltis (1976) have used the terms marketed and non-marketed output to divide economic activities. Almost everything that the private sector produces is marketed, that is, it is sold to someone. Most, although not all, of the output of the public sector is non-marketed (a publicly-run transportation system which makes losses obviously markets a fraction of its output; a profit making nationalised industry markets its entire output). Increases in government employment are thus generally associated with increases in the non-marketed share of output. This implies that a smaller proportion of market-sector workers must generate the surplus which provides not only the increased needs of consuming marketed goods and services by the public sector workers, but it must also endow them with the necessary capital (i.e. offices, computers, etc.) to perform their duties. The increased taxation which this necessitates, in so far as it reduces net-of-tax

profits, will also dampen investment since firms may consider it imprudent to borrow the funds which they can no longer find from their own profits (see, Greenwald and Stiglitz, 1988). The LD curve can thus shift to the left as a result of a reduced capital stock in the sector producing marketed output.

A more important adverse consequence of increases in government employment is on the dynamic performance of the economy. It is well known that both private and public rent seeking behaviour is inimical to growth because it generates uncertainty regarding the allocation of property rights (see, Murphy *et al*., 1991). A property of the rent-seeking technology itself is that it displays increasing returns. Rent seekers have a "strength in numbers" (see, Murphy *et al*., 1993). If only a few people steal or accept bribes, they run a high risk of getting caught and punished; but if, for example, most of the government employees are corrupt, the probability of anyone getting caught and being punished is much lower, and hence the returns to corruption are higher. Moreover, an increase in the number of government employees removes a larger part of the population from the "discipline of the market" making it independent of private sector interest for its livelihood. A "culture" of indifference or even hostility towards private sector interests is then more likely to develop amongst government employees, which may make it more likely that corruption and bribing are practised with a "clear conscience". Furthermore, as argued by Murphy et al. (1993), public rent seeking (corruption, bribing, etc.) may afflict innovative activity more than private rent-seeking (theft, lobbying, etc.) and therefore it can reduce by more the rate of firm and job creation.

Public rent-seeking is particularly harmful to the creation of firms, since to start a new firm an entrepreneur needs government-supplied goods such as permits, licenses,

tax documents much more than established producers[3]. The demand for these government produced goods by would-be entrepreneurs is high and inelastic and hence they become the primary targets for expropriation by corrupt government employees. Established producers usually do not need as many government goods, since they have acquired them already. Moreover, established producers are usually "insiders" and may use their government "contacts" to stop the granting of necessary licenses and permits to would be competitors ("outsiders").

Starting a new firm typically involves a high degree of risk. Rent seeking increases the riskiness of the project even further since if the entrepreneur is successful part of the profit is expropriated (either through bribes or high profit taxes which are needed to support a large number of government employees), whereas if she fails she bears the entire cost. The upshot of all these is a reduction in the rate of firm (and job) creation and a reduction in the degree of competition. Both of these effects are expected to shift the (aggregate) LD curve to the left, resulting in higher unemployment[4].

To summarise the arguments of this section, there are many possible channels through which changes in government employment affect the economy. *A priori*, it is impossible to know the relative strength of each argument. We conclude therefore that economic theory provides no definite answer regarding the unemployment effects of changes in government employment. Accordingly, we will adopt a relatively unstructured approach to model specification and estimation.

3. Econometric Method and Estimation

We begin our empirical analysis by estimating unrestricted reduced-form VARs for Germany, Japan and the U.S., using the OECD Business Sector Database (BSD)[5], e.g.

$$\mathbf{A}(L)\,\mathbf{y}_t = \mathbf{c}_0 + \mathbf{u}_t, \text{ where}$$

$$\mathbf{A}(L) = \mathbf{I} - \mathbf{A}_1 L,\ldots,\mathbf{A}_p L^p, \tag{5}$$

$$\mathbf{u}_t \sim \text{VWN}(0,\mathbf{S}) \text{ and } E(\mathbf{u}_t, \mathbf{u}_t') = \mathbf{S}.$$

For the reasons discussed above, we initially avoid imposing any *apriori* theoretical constraints on (5) apart from specification of the number and type of economic variables included in the vector $\mathbf{y}_t$. Our interest in the unemployment effects of government employment and the theoretical considerations discussed in Section 2, suggests that the most parsimonious set of variables which should be incorporated in $\mathbf{y}_t$ should include the levels of *W*, *UN* and N_G[6]. Prior to estimating (5) however, we examine the univariate properties of these time-series (see Table 1)[7].

The preponderance of evidence reported in Table 1 suggests that all of the variables are I(1). Whilst imposing the cointegrating rank restrictions would clearly yield more efficient estimates of the reduced-forms, informed by our discussion and analysis in Section 2, we instead proceed to estimate the unrestricted reduced-form (5) in levels.[8] To reduce the over-parameterisation problem inherent in VARs (see Sims, 1980), we conduct Likelihood Ratio, Aikaike Information and Schwartz Bayesian Criterion optimal lag length tests using an upper bound, m=4 quarters, (see Tables 2 and 3). The results in these tables indicate that the appropriate VAR order for each country is as follows: Germany(2-lags), Japan(3-lags) and U.S.(2-lags).

Table 1. Unit Root Tests

	Germany			Japan			U.S.		
	STAT.[a]	*P-VALUE*[b]	*LAGS*[c]	*STAT.*	*P-VALUE*	*LAGS*	*STAT.*	*P-VALUE*	*Lags*
W_1	1.00	0.99	4	0.62	0.99	4	1.61	0.99	3
W_2	-1.60	0.83	3	-2.20	0.76	4	-2.11	0.77	3
ΔW_1	-3.33	0.004	4	-2.36	0.075	4	-5.49	6.9E-06	2
ΔW_2	-163.6	4.2E-18	4	-161.4	7.1E-18	4	-104.7	6.6E-12	2
UN_1	-1.45	0.55	3	0.39	0.99	2	-1.57	0.46	3
UN_2	-1.08	0.88	3	-1.84	0.80	2	-3.46	0.60	3
ΔUN_1	-3.96	0.001	2	-5.27	0.0001	2	-4.93	0.0004	4
ΔUN_2	-42.7	0.00004	2	-118.4	2.1E-13	2	-56.2	1.3E-06	4
N_{G1}	0.54	0.99	4	0.47	0.99	4	0.32	0.99	4
N_{G2}	-1.77	0.81	3	-0.84	0.90	4	-1.64	0.82	4
ΔN_{G1}	-1.77	0.317	4	-2.44	0.059	4	-2.61	0.036	4
ΔN_{G2}	-25.92	0.003	4	-26.7	0.002	4	-59.3	5.8E-07	4

[a] The subscripts (1) and (2) under the Test Statistic column (*STAT.*) refer to the Weighted Symmetric (see Pantula, *et al*., 1994) and the Phillips-Perron (see Phillips and Perron, 1988) tests for unit roots respectively.

[b] The P-values for the above tests are calculated using the tables in MacKinnon (1994).

[c] The unit root tests were calculated from lags 4 to 0 and include a constant. The column *LAGS* refers to the optimal lag length in the testing regression, that are chosen by the Aikaike Information Criterion (AIC). Note that the above results were robust to both the inclusion of a linear deterministic trend as well as the exclusion of any deterministic components. Additionally, in most cases, the above results were robust across all lag lengths. The exceptions were ΔN_{G1} for Germany and ΔN_{G1} and ΔW_1 for Japan which were found to be stationary (< 5% sig. level) with fewer lags than reported above. To conserve space these results are not reported here but will be made available upon request.

Table 2. Likelihood Ratio (LR) Statistics for the Wage/Unemployment/ Government Employment System

i	H_o^i	VAR order under H_o^i	l_{LR}[a]			l^*_{LR}[b]		
			GER	JPN	U.S.	GER	JPN	U.S.
1	$A_4=0$	3	3.71	8.06	3.41	3.29	7.16	3.10
2	$A_3=0$	2	2.59	78.0	1.48	2.30	69.3	1.35
3	$A_2=0$	1	111.3	174.6	79.8	98.9	155.1	72.7
4	$A_1=0$	0	1535	1497	1993	1363	1329	1811

[a] The likelihood ratio test λ_{LR} is equal to $T\{\ln\left|S^*_{\mathrm{r}}\right| - \ln\left|S^*_{\mathrm{u}}\right|\}$, where T is the number of observations and S^*_{r} and S^*_{u} refer to the estimated residual covariance matrices for the restricted and unrestricted systems respectively.

[b] l^*_{LR} *is* calculated using a modification recommended by Sims (1980) to correct for small-sample bias, i.e. $l^*_{LR} = (T - c)\{\ln\left|S^*_{r}\right| - \ln\left|S^*_{u}\right|\}$, where *c* is the number of parameters estimated in each equation of the unrestricted system. The critical value for the individual 5% level test is $\chi^2(9)_{0.95}$=16.9.

Table 3. Aikaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) for the Wage/Unemployment/Government Employment System[a]

VAR order *m*	*AIC*			*SBC*		
	GER	JPN	U.S.	GER	JPN	U.S.
4	-17.31	-19.10*****	-20.08	-24.89	-26.69	-27.78
3	-17.41	-19.10*****	-20.11	-25.21	-26.91*****	-28.00
2	-17.50*****	-18.50	-20.16*****	-25.52*****	-26.52	-28.24*****
1	-16.62	-17.07	-19.66	-24.84	-25.30	-27.92
0	-4.42	-5.74	-6.25	-12.86	-14.19	-14.70

[a]The AIC and the SBC are calculated respectively as $AIC = T\ln\left|S^*_{m}\right| + 2N$ and $SBC = T\ln\left|S^*_{m}\right| + N\ln(T)$, where S^*_{m} is the estimated covariance matrix of residuals and N is the total number of parameters estimated in all equations of the system. Note that * denotes the minimum.

The final issue to be addressed prior to conducting innovation accounting in Section 4 relates to identification of the underlying structural policy and non-policy shocks. As is well known, the $\mathbf{u}_t$ vector in (5) comprises contemporaneously correlated structural shocks or innovations. The approach we adopt here to exactly identify the VAR is based on the well known Choleski decomposition of **S**. This decomposition imposes a triangular recursive, or Wold, causal structure between the contemporaneous endogenous variables. Our particular implementation of this orthogonality restriction is based on a mixture of theoretical and empirical priors relating to the economies under study.

In accordance with the overwhelming evidence on short-run wage and price rigidity, we do not allow real wages to respond contemporaneously (i.e. within a quarter) to shocks in government labour demand and unemployment. To allow for the possibility of a government reaction function, unemployment preceeds public employment in the Wold casual ordering. This assumption clearly rules out the

possibility of changes in government employment contemporaneously affecting unemployment. However, we found that reversing the ordering leads to an insignificant contemporaneous link running from government employment to unemployment for all countries. Furthermore and more importantly, the impulse responses of all variables to shocks in government employment remained qualitatively and statistically unaltered over the entire simulation period (i.e. 10 years). We return to this issue of a government reaction function below.

4. Innovation Accounting

Figures 3, 4, and 5 plot the impulse response functions for each of the three variables in response to shocks to the real wage, unemployment and government employment for Germany, Japan and the United States. In each case, the shock is scaled as one-standard deviation and the responses are shown over a ten-year horizon. Standard error bands are also included, these employ the asymptotic formula provided by Hamilton (1994). In Table 5 the forecast error variance decomposition for each of the above mentioned shocks are shown for the three countries at 1, 5 and 10-year intervals. Next we examine the estimated effects of each structural shock and the related variance decompositions in more detail.

4.1 Real Wage Shocks

Figure 3 summarises the response of the three economies to a positive, one-standard deviation shock to the real wage disturbance. Both the short-run and the long-run response of real wages to this shock are positive. After 40 periods (10 years) real wages will be about 0.5 percent higher in Germany and Japan and about 0.2 percent higher in the U.S.. It can also be observed that the adjustment to the long-run

equilibrium will be faster in the U.S. than in Germany and Japan. These findings suggest that real wage rigidity is stronger in Germany and Japan - a fact which at least in the context of Europe - U.S. comparisons seems to be indisputable (see, Bruno and Sachs (1985)). In none of the three countries do real wage shocks account for any less than 75 percent of real wage variability even after the passage of 10 years (see Table 4). This finding certainly seems at odds with the new classical view of real wage determination.

Table 4. Forecast Error Variance Decomposition

Germany

Variance Decomposition of:	After 1-Year			After 5-Years			After 10-Years		
	W	*UN*	N_G	*W*	*UN*	N_G	*W*	*UN*	N_G
W	90.9	7.9	1.2	78.1	19.5	2.3	76.5	21.2	2.3
UN	8.2	91.6	0.1	7.4	92.0	0.6	11.2	87.9	0.9
N_G	5.9	1.3	92.8	61.1	15.3	3.6	67.1	20.4	12.5

Japan

Variance Decomposition of:	After 1-Year			After 5-Years			After 10-Years		
	W	*UN*	N_G	*W*	*UN*	N_G	*W*	*UN*	N_G
W	96.0	2.7	1.2	93.8	0.7	5.5	82.6	0.4	16.9
UN	0.5	96.2	3.3	2.9	67.9	29.2	8.5	61.8	29.8
N_G	5.4	1.8	92.8	12.9	6.1	81.0	42.1	3.9	54.0

U.S.

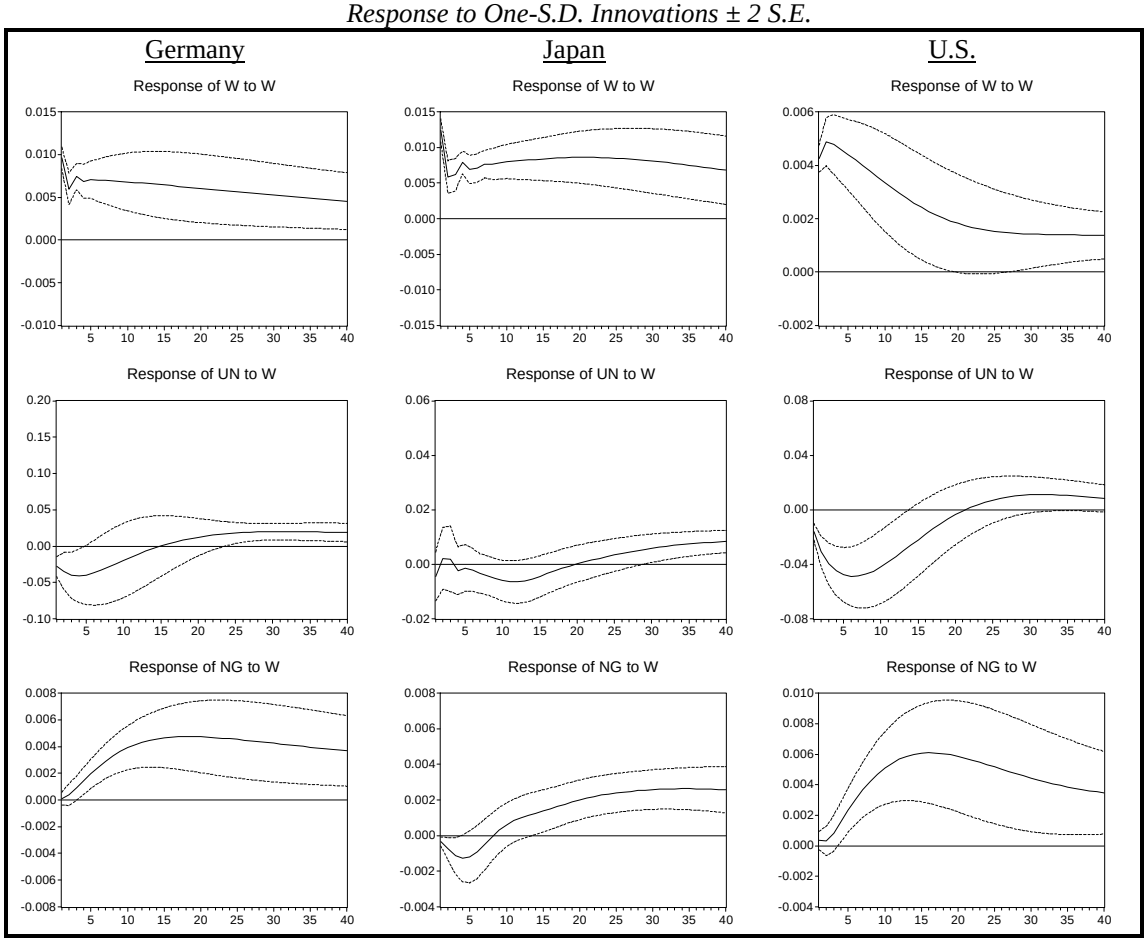
Variance Decomposition of:	After 1-Year			After 5-Years			After 10-Years		
	W	*UN*	N_G	*W*	*UN*	N_G	*W*	*UN*	N_G
W	96.8	0.1	3.1	90.7	3.6	5.7	86.4	5.0	8.5
UN	30.9	67.5	1.5	50.6	46.9	2.5	50.9	45.2	3.9
N_G	42.1	0.7	5.3	59.6	1.3	39.1	67.6	2.9	29.6

Examining the effects of (real) wage shocks on unemployment reveals greater differentiation of responses for the three countries. In the U.S. there is a quantitatively important and statistically significant drop in unemployment which lasts about 3 years, after which the drop in the unemployment becomes negligible and insignificant. In the long-run, unemployment is not significantly different from its pre-shock level. The

same quantitatively important drop in unemployment is observed for Germany, but it is insignificant in the short-run. In the long-run, unemployment returns to and eventually exceeds its pre-shock level. This statistically significant rise in unemployment is about 0.2 percent. In the case of Japan, there is a quantitatively unimportant and insignificant fall in unemployment which becomes significant in the long-run (a rise of about 0.7 percent). The eventual rise in unemployment for all countries could be interpreted as the result of an upward shift of the WS schedule in Figure 1.

Figure 3. Cross Country Responses to Real Wage Shocks[a]

Response to One-S.D. Innovations ± 2 S.E.



[a] All variables are in natural logs.

How should we interpret the short-run drop in unemployment? A Keynesian explanation would have real wages positively affecting product demand (firms are assumed to be constrained in the amount of output which they can sell) and have a

positive impact on the hiring decisions of firms. In an open economy context an implication of this explanation would be that, the larger the country, the smaller the leakage to imports from abroad, and therefore the larger the drop in unemployment. This is consistent with our results in which the short-run decrease in unemployment is bigger in the U.S. than in Germany and Japan.

Alternative explanations for the short-run response of unemployment to changes in the real wage may rely on a positively sloped labour demand relation. However, such an explanation requires that the LD schedule in Figure 2 be not only upward sloping, but also steeper than the WS schedule. Moreover, it is hard to find a convincing explanation as to why the slope of the LD schedule changes as we move from the short- to the long-run.

4.2 Unemployment Shocks

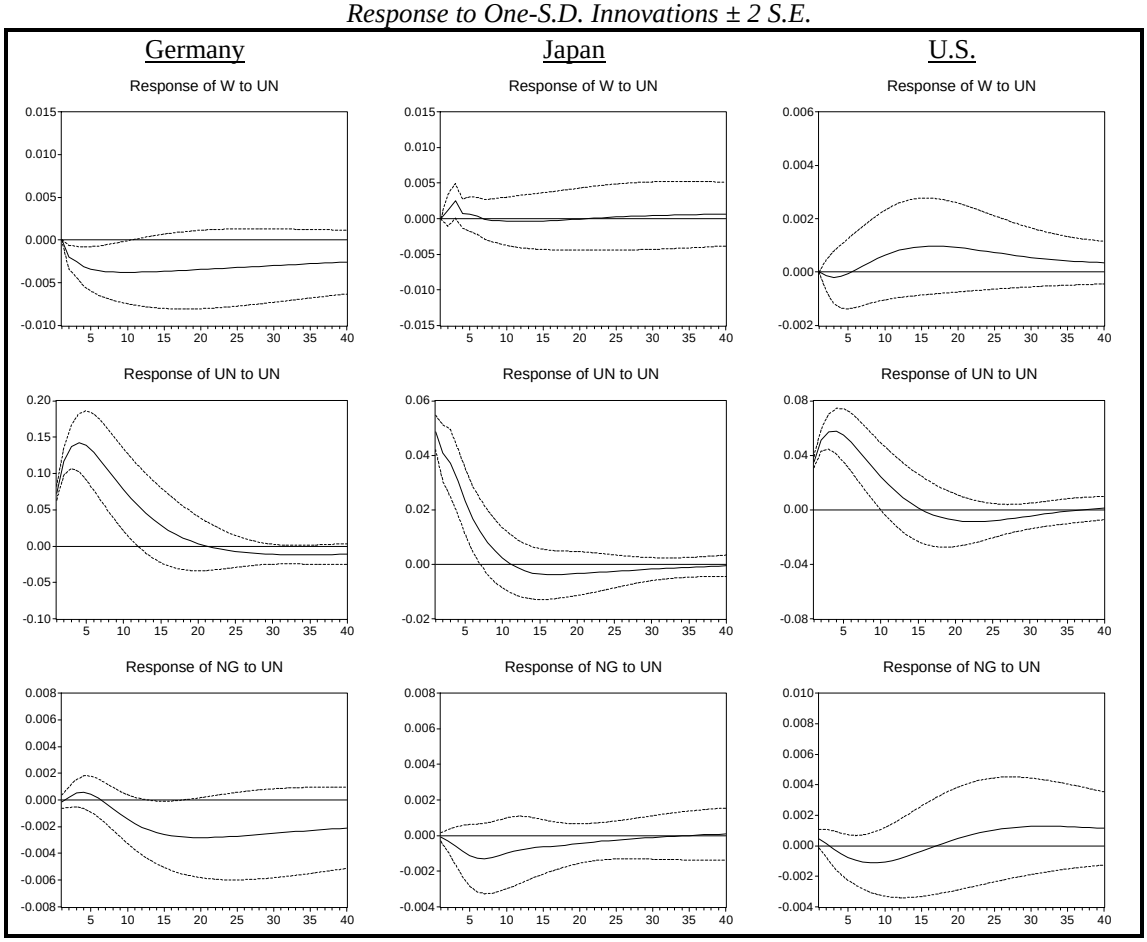
Figure 4 summarises the three economies responses to a positive shock to the unemployment disturbance in each country. With the exception of Germany in the short-run, there is no statistically significant effect on real wages either in the short-run or the long-run. After an initial increase, unemployment in all countries returns to the initial level in the long-run. Taken together, these findings question the hypothesised relationship between (real) wages and unemployment expounded in the first part of Section 2.

Table 4 provides us with some evidence regarding the persistence of unemployment. From Table 4 we see that in Germany nearly 90 percent of the evolution of unemployment, even after 10 years, is explained by the unemployment shock. The corresponding figures for Japan and the U.S. are about 60 percent and 45

percent, respectively. Unemployment is thus highly persistent in Germany and less so in the other two countries. By contrast, real wage shocks are far more important in explaining the evolution of unemployment in the U.S. after 10 years (about 50 percent) than in Germany and Japan (about 10 percent in each case). Both of these findings accord well with other international evidence on the relative persistence of unemployment and flexibility of the labour markets in these countries (see, Layard, Nickell and Jackman, *op cit*.).

Figure 4. Cross Country Responses to Unemployment Shocks[a]

Response to One-S.D. Innovations ± 2 S.E.



[a] All variables are in natural logs.

The forecast error variance decomposition table reveals also that there are significant differences amongst the three countries in their policy-makers' behaviour. Whereas in the U.S. and Japan the evolution of government employment is fairly

independent of the unemployment shock (both after 5 and 10 years), in Germany about 20 percent of the forecast error variance of government employment is explained by unemployment after 10 years. This finding provides indirect evidence for the presence of a government reaction function in Germany, but not in Japan and the U.S.. Anecdotal evidence relating to the behaviour of European governments which have attempted to reduce unemployment by expanding their hiring when the private sector sheds jobs is certainly in accordance with these findings.

4.3 Government Employment Shocks

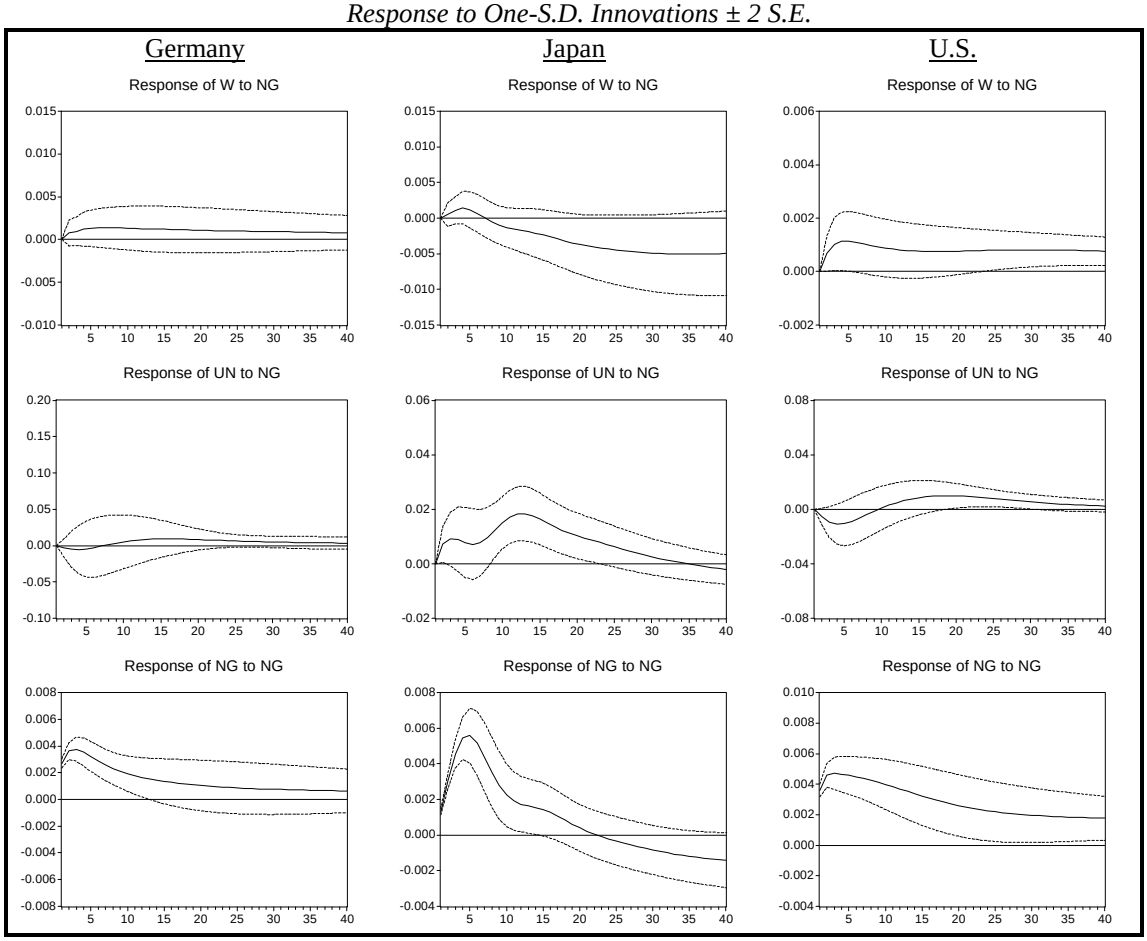
The only country in which government employment has a statistically significant impact on wages is the U.S., and this only relates to the long-run. Nevertheless, the quantitative effect of a one-standard deviation shock to government employment on real wages is small; resulting in a rise of only 0.2 percent. By contrast, in Japan there is an insignificant but quantitatively more substantive fall in the real wage by about 0.5 percent in the long run, whereas in Germany wages remain largely unaffected during the whole adjustment period (see Figure 5). The different reaction of real wages in the three countries to changes in government employment can be explained by the different uses in which government employees are put in each country, and/or by differences in economic structure. Consequently, an interpretation for the rise of real wages in the U.S. may be that government employees are used in activities which enhance private sector productivity to a greater extent than in Germany and Japan.

Contrary to Figure 2 (but in accordance with the discussion in Section 2), our results do not show that unemployment responds negatively to increases in government employment. In fact, for all three countries unemployment remains constant in the long run (10 years), whereas in Japan there is a statistically significant increase in

unemployment between the second and fifth year after the shock. The constancy of unemployment in the long-run implies that the crowding-out of private employment by government employment is complete (under the proviso that the labour force remains unchanged). Next we examine several various objections to this conclusion. These include the existence of a government reaction function and the endogeneity of the labour force.

Figure 5. Cross Country Responses to Government Employment Shocks[a]

Response to One-S.D. Innovations ± 2 S.E.



[a] All variables are in natural logs.

5.4 Further Analysis of the Full Crowding-Out Finding

One potential objection to the finding of the full crowding-out of private by government employment is the existence of a government reaction function. Under this scenario, government employment increases may be successful in keeping

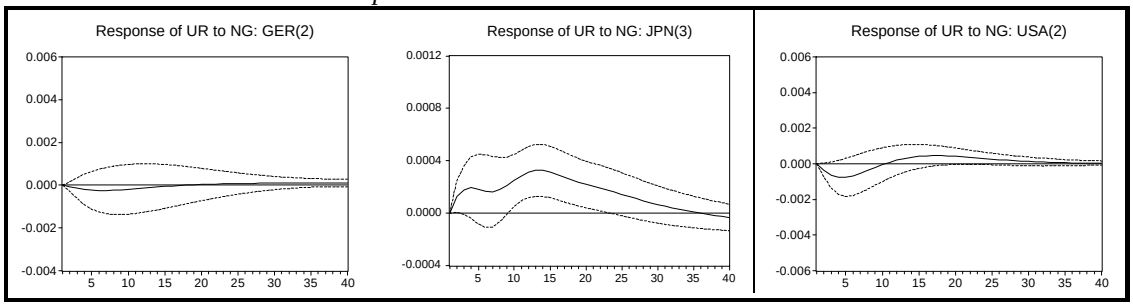
unemployment at a lower level than would be achieved otherwise. The forecast error variance decomposition table reveals that unemployment shocks account for a maximum of only 6 percent of government employment variability in Japan and for a maximum of only 3 percent in the U.S.. We interpret this finding as evidence against the existence of a policy reaction function running from unemployment to government employment in these two countries. For Germany, the unemployment shock accounts for about 15 percent of the variability of government employment after 5 years, and for about 20 percent after 10 years. As a result, the existence of a government reaction function cannot be ruled out for this country[9]. Hence it is possible that the data for Germany were generated, at least in part, by the attempts of the government to keep unemployment low in the face of adverse private employment shocks, through increases in government employment. This conclusion must be tempered, however by the evidence presented in Figure 4 which shows that there is a negative and statistically insignificant response of government employment to unemployment shocks in Germany (perhaps due to budget constraints).

We now deal with the issue of the potential endogeneity of the labour force. It is obvious that, if as a result of increases in government employment the number of unemployed workers remains constant but the labour force increases, there may be no crowding-out. The basic theory presented in Section 2 can be easily modified and instead of the level of (un)employment, the (un)employment rate can be the variable which appears on the horizontal axis in Figures 1 and 2 (see Layard, Nickell and Jackman, *op cit.*). In Figure 6 we show the impulse responses of the unemployment rate (and the standard errors) for the real wage - unemployment rate - government employment system resulting from a one-standard deviation shock to the government

employment disturbance in the three countries. Comparison of Figures 5 and 6 reveals that (except for the units of measurement) there is no difference in the impulse responses, i.e. the long-run unemployment rate is unaffected by changes in government employment.

Figure 6. Cross Country Responses to Government Employment Shocks for the Real Wage/Unemployment Rate/Government Employment System[a]

Response to One S.D. Innovations ± 2 S.E.



[a] All variables are in natural logs.

5. Concluding Comments

The main finding of our analysis for Germany, Japan and the U.S. is that both the level of unemployment and the unemployment rate are independent of innovations to the level of government employment. This implies that the sum of the "direct" and "indirect" crowding-out of private employment is equal to the change in government employment innovations (full crowding-out). However, this similarity in outcomes for the three countries hides differences in the relative importance of the "direct" and "indirect" crowding-out effects and in the transmission mechanism.

According to Section 2, the main cause of the "indirect" crowding-out effect is the upward pressure on real wages resulting from increases in government employment. But as Figure 5 demonstrates, a positive government employment shock produces a statistically significant but quantitatively unimportant increase in real wages in the U.S., whereas it causes a statistically insignificant fall in Japan. For Germany there is hardly

any change in the real wage. We may conclude, therefore, that the first link in the transmission mechanism for the "indirect" crowding-out effect is not operating. Moreover, the supposed second link (a positive relationship between real wages and unemployment) has been found to be very weak (see Figure 3). This puts further doubt on the relevance of the "indirect" crowding-out effect and suggests that the detrimental effects of government employment on private employment cannot be captured by the standard models.

One fundamental deficiency of models with a macroeconomic labour demand curve based on the assumption of representative firms is that recessions and booms are represented as movements along this curve. According to the prevailing view, unemployment outflows are procyclical whereas unemployment inflows are countercyclical. But as Davis, *et al*. (*op cit*.) and Burda and Wyplosz (1994) have shown, both hiring and firing are evident in recessions and, more surprisingly, both are larger in recessions than in booms. This implies that there is significant firm heterogeneity in the real world. Indeed, as Davis, *et al*. (*op cit*.) report, job creation and destruction in the manufacturing sector often involve one set of plants creating a large number of new jobs while, during the same year, another set destroys a large number of existing jobs. Associated with these changes are the creation and destruction of plants and firms. Forces that determine the rates of creation and destruction of firms are thus very important for understanding the evolution of aggregate (un)employment.

Government policy is critical in this respect in that it can both encourage and discourage the creation of employment and firms. Consider for example, an increase in government employment financed by an increase in the tax rate on profits. Standard economic analysis suggests that an increase in the tax rate will not affect the

employment decision of a firm. Nevertheless, this is true only for a firm that remains in business. The firm may well decide that it is no longer worthwhile staying in business. For the same reason, an entrepreneur planning to start-up in business may forego such an undertaking if the profit tax rate increases. In addition to these adverse effects, government employees are usually hired to perform some function. Often this results in increased legal and bureaucratic regulation - outcomes which too often result in corruption (see, Shleifer and Vishny, 1993) and hinder the creation of new firms. It is obvious that the combination of high fixed costs and high tax rates is a most effective way for reducing firm (and employment) creation and increasing the rate of business failure (and employment destruction).

Based on our empirical findings, it appears that government employment increases fully crowd-out private employment although this does not seem to be explained well by the usual relative price mechanisms. We conclude therefore, that it may be worthwhile to supplement the traditional approach in which unemployment is viewed as exclusively as a labour market phenomenon by a more broadly based evaluation of the effects of government activity. In future research we intend to further explore the link between changes government employment and firm creation and destruction by examining the available international survey evidence on numbers of manufacturing establishments.

6. References

Bacon, R. and W. Eltis, 1976, Britain's Economic Problem: To Few Producers, McMillan Press.

Blanchard, O. and L. Summers, 1988, Beyond the Natural Rate Hypothesis, American Economic Review, 78, 182-87.

Bruno, M. and J. Sachs, 1985, Economics of World Wide Stagflation, Oxford, Basil Blackwell, Oxford.

Burda, M. and C. Wypolz, 1994, Gross Worker and Job Flows in Europe, European Economic Review, 38, 1287-1315.

Calmfors, L., 1994, Active Labour Market Policy and Unemployment - A Framework for the Analysis of Crucial Design Features, OECD Economic Studies, 22, 7-47.

Davis, S. and Haltiwanger, J., and S. Schuh, 1996, Job Creation and Destruction, MIT Press, Cambridge MA.

De Soto, H., 1989, The Other Path, Harper and Row, New York.

Evans, P. and G. Karras, 1994, Are Government Activities Productive? Evidence from a Panel of U.S. States, The Review of Economics and Statistics, LXXVI, 1-11.

Greenwald, B. and J. Stiglitz, 1988, Imperfect Information, Finance Constraints and Business Fluctuations, in M. Kuhn and S.C. Tsiang, (eds.), Finance Constraints, Expectations and Macroeconomics, Oxford University Press, 103-40.

Hamilton, J, 1994, Time Series Analysis, Princeton University Press, Princeton, NJ.

Johnston, J., 1975, A Macro-Model of Inflation, Economic Journal, 85, 288-308.

Keese, M., Salou, G. and P. Richardson, 1991, The Measurement of Output and Factors of Production for the Business Sector in OECD Countries (The OECD Business Sector Database), OECD Department of Economics and Statistics Working Paper No. 99.

Layard, R., Nickell, S. and R. Jackman, 1991, Unemployment, Oxford University Press, Oxford.

Lindbeck, A., 1990, The Swedish Experience. Institute for International Economic Studies Seminar Paper 482, University of Stockholm.

Lindbeck, A., 1993, Unemployment and Macroeconomics, Ohlin Lectures, No. 3., MIT Press, Cambridge MA.

Lindbeck, A., 1996, The West European Employment Problem, Weltwirtschaftliches Archiv, 132, 609-637.

MacKinnon, J.G., 1994, Approximate Asymptotic Distribution Functions for Unit-Root and Cointegration Tests, Journal of Business and Economic Statistics, 12, 167-176.

Malley, J. and T. Moutos, 1996, Does Government Employment "Crowd-out" Private Employment? Evidence from Sweden, Scandinavian Journal of Economics, 98, 289-302.

Murphy, K.M., Shleifer, A. and R. Vishny, R., 1991, The Allocation of Talent: Implications for Growth" Quarterly Journal of Economics, 106, 503-30.

Murphy, K.M., Shleifer, A. and R. Vishny, R., 1993, Why is Rent Seeking so Costly to Growth?, American Economic Review Papers and Proceedings, 83, 409-14.

Pantula, S.G., Gonzalez-Farias, G. and W.A. Fuller, 1994, A Comparison of Unit-Root Test Criteria, Journal of Business and Economic Statistics, 12, 449-459.

Phillips, P.C.B., and P. Perron, 1988, Testing for a Unit Roots in Time Series Regression, Biometrika, 75, 335-346.

Shleifer, A. and R. Vishny, R., 1993, Corruption, Quarterly Journal of Economics, 108, 599-617.

Sims, C., 1980, Macroeconomics and Reality, Econometrica, 48, 1-49.

Sims, C., Stock, J. and M. Watson, 1990, Inference in Linear Time Series Models with Some Unit Roots, Econometrica; 58 113-44.

Smith, A., 1776, An Inquiry into the Nature and Causes of the Wealth of Nations, London: W. Strathan and T. Cadell; reprinted, Everyman's Library, 1910, London.

6. Data Appendix

Table A1. Data Source, Definitions and Transformations

Source:	OECD Business Sector Database (BSD) 1996 (see also Keese *et al.* 1991).	
Identifier	Definition	Transformation
N	Total employment	BSD
N_G	Government employment	BSD
P	Implicit GDP price deflator	BSD
UN	Unemployment	$UN=(UR*N)/(1-UR)$
UR	Unemployment rate	BSD
WN	Compensation per employee, private	BSD
W	Real compensation per employee, private	$W=WN/P$
Y	Real GDP	BSD
Code	Country	Estimation Period for the W, UN, N_G System
GER	Germany	1960:3[a] to 1989:4[b]
JPN	Japan	1965:4 to 1994:4
U.S.	United States	1960:3 to 1996:2

[a] The start dates for each country have been adjusted to reflect the number of lags used in estimation.
[b] In Germany, the end of the sample was truncated to 1989:4 due to reunification.

Endnotes

[1] This latter assumption is made here only for presentational purposes. In the econometric work which follows government employment is allowed to respond endogenously to the other variables in the system.

[2] Nevertheless, there exists some evidence for the U.S. that only government educational services are productive. For other government activities there is evidence that they are unproductive (see, Evans and Karras, 1994).

[3] An extreme example of this is reported by De Soto (1989). In 1983 in Peru it took four university students 289 days of full-time work to obtain the permits required to open a small garment assembly shop.

[4] This conclusion should be contrasted with Lindbeck (1996) who states that the "…long-term equilibrium unemployment rate would be independent of the composition of aggregate employment between sectors".

[5] See the Data Appendix for definitions, transformations and time-periods over which the estimation is undertaken.

[6] Given our discussion in Section 2.2, and the importance we have attached to the effects of government employment on firm creation and destruction, the number of firms (establishments) should also be included in y_t. Unfortunately, only very patchy manufacturing survey data exists for this measure.

[7] Note that the series are logged in all of the empirical analysis which follows.

[8] For a discussion of the issues involved in estimating VARs with integrated data see Sims, *et al.*, 1990.

[9] This finding certainly matches well with the anecdotal evidence of greater government intervention in Germany than in Japan and the U.S..