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Employment Adjustment versus Hours Adjustment: Is Job Security Desirable?

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Firms can adjust to shocks by laying off and hiring workers, or by adjusting the hours worked by each worker. Adjustment of hours provides job security for employed workers. Adjustment of employment generates higher labour market turnover and thus better job prospects for the unemployed. Since high turnover lowers the expected cost of being laid off by reducing the expected duration of unemployment, there is a strategic complementarity between firms in the provision of job security. This gives the possibility of multiple equilibria with different amounts of turnover.

INTRODUCTION

Many labour contracts contain provisions reflecting the desire workers have for job security. One such provision concerns whether firms that are faced with the need to alter total labour input will adjust by changing the number of workers employed, or by changing the number of hours worked by each employee. As discussed by Fitzroy and Hart (1985), there is considerable evidence that the use of hours adjustment ('work-sharing') as a way of adjusting to labour-demand shocks is much more common in Europe than in North America.

Any worker, given the choice between two contracts that offer the same wage, but with one specifying employment adjustment and the other specifying hours adjustment, would likely prefer the job security contained in the latter. But not all contracts offer job security, suggesting that some firms find it costly to provide. In this case, there is no reason why the wages offered in the two types of contract would be the same. This is the essence of the debate over the merits of government-mandated job security. As discussed by Abraham and Houseman (1991), Houseman (1990) and Lazear (1990), any direct benefits to workers have to be balanced against the possible indirect costs of lower wages or higher unemployment.

This paper presents a theoretical framework for examining the desirability of job security. Its focus is on the relationship between job security and labour market turnover, and the implications of this relationship for the nature of labour market equilibrium. The analysis is an attempt to provide a precise interpretation of the sort of argument one often hears about the potential effects of legislation on labour market flexibility. A recent example is found in the 1992 *OECD Employment Outlook:*

> One way governments influence the job matching process is through systems of regulations on hiring and separations. If these are too restrictive, employers may become overly cautious about taking on new staff, especially from the ranks of the unemployed . . . The result will be lower levels of vacancies and labour turnover, and delays in structural adjustment. . . . systems of labour market regulation need to be reviewed to ensure they are not responsible for unnecessary rigidities. (OECD 1992, p. xii).

This paper highlights a negative externality associated with job security that is unrelated to any indirect effects on wages or employment. Even if wages and unemployment are held constant, we argue that job security may be undesirable for risk-averse workers overall: the adoption of hours-adjustment contracts by one group of workers may reduce the amount of labour market turnover and so reduce the re-employment prospects of unemployment workers.

In addition to the normative implications of this externality, we discuss one positive implication for the nature of labour market equilibrium. The cost to a worker of being laid off depends on how quickly he is reabsorbed into the workforce; if turnover is high, reabsorption is likely to be quick and the expected cost of layoff low. Since the use of employment adjustment produces greater turnover than hours adjustment, the cost of being laid off depends on the number of firms in the economy using employment-adjustment contracts. The cost that job security for some employed workers imposes on unemployed workers is then also imposed on employed workers at other firms. This spillover can lead to the choice of contract type being a strategic complement to the choices made in other firms, giving the possibility of multiple equilibria with different amounts of job security in each.

In Section I we lay out the structure of a simple two-period model which presents employment adjustment and hours adjustment as alternative responses to labour demand shocks. In Section II we consider only the direct effects of job security and show that, even with wages and unemployment held constant, job security is undesirable for workers overall. In Section III we model the actual contract choice of workers and firms and show how, even when wages and unemployment depend on the amount of job security, the same turnover externality can lead to a strategic complementarity between the workers at different firms in the choice of contract. We discuss the empirical validity of one of our key assumptions in Section IV.

I. A Simple Model of Job Security and Turnover

We consider a two-period economy in which there is an infinity of firms, each of which is subject to random shocks in labour demand at the beginning of the second period. We approach the issue of job security by modelling the choice between labour contracts that permit only employment adjustment and those that permit only hours adjustment.

Timing

At the beginning of the first period, a fraction, e, of the labour force is randomly selected to be employed, and the remaining $1-e$ to be unemployed. As a result

of the shocks, each employed worker faces a probability, l, of being laid off from his job at the start of the second period, and each unemployed worker faces a probability, h, of being hired. Workers who are laid off join the unemployment pool and can be immediately rehired by an expanding firm, also with probability h.[1]

Since we are concerned with modelling how different forms of labour market adjustment affect the distribution of workers' lifetime income, and not with business-cycle fluctuations, the employment rate is assumed to be constant across the two periods. This implies that the total number of unemployed workers hired in the second period must equal the total number of laid-off workers who do not get rehired,

$$(1) \qquad el(1-h)=(1-e)h \Rightarrow h=\frac{el}{(1-e)+el}.$$

Although the employment rate is assumed to be constant over the two periods, this steady-state rate can be affected by the amount of labour market turnover and hence by the amount of job security. In Section II we focus only on the direct effects of job security; we therefore assume an exogenous employment rate. This assumption is relaxed in Section III.

Workers

Workers are identical and risk-averse. Each employed worker receives a wage of w per hour and has a constant disutility of work of v per hour. Workers have preferences over their combined two-period net income, I, given by the strictly concave utility function U. Let H_t be the number of hours worked by a worker in period t. His two-period net income is then $I=(w-v)(H_1+H_2)$. We assume that $w>v$ so that workers have perfectly elastic labour supply.[2]

Labour demand shocks

Firms are indexed by i. Each firm employs L_{it} units of labour input in period t which is given by $L_{it}=N_{it}H_{it}$, where N_{it} is the number of employees. In the first period, H_i is the same for all firms. We interpret this as a social norm such as a 40-hour week. Without loss of generality, let this economy-wide value of H_{i1} be equal to 1, so that

$$L_{i1}=N_{i1}\forall i.$$

In the second period, each firm is subjected to a random shock, μ_i, which proportionately affects its demand for total labour input,

$$L_{i2}=L_{i1}(1+\mu_i) \qquad \mu_i \geq -1.$$

The shock μ_i is assumed to be independently and identically distributed across all firms according to the zero-mean, non-degenerate distribution F.

A firm using employment-adjustment contracts keeps hours constant and adjusts only through layoffs and hires, so that

$$N_{i2}=N_{i1}(1+\mu_i),$$

$$H_{i2}=1.$$

A firm using hours-adjustment contracts keeps employment constant and adjusts only through the number of hours, so that

$$N_{i2} = N_{i1},$$

$$H_{i2} = (1 + \mu_i).$$

Note that the assumptions of an infinity of firms and zero-mean, i.i.d. shocks ensure that aggregate employment, aggregate total labour input and the economy-wide average of H_i are all constant across the two periods.

II. The Direct Effects of Job Security

To isolate the direct effects of job security, we assume in this section that the wage and employment rates are exogenous. We examine the desirability of job security by considering a change in the proportion of firms that use hours-adjustment contracts and examining how such a change affects the expected utility of a worker whose first-period employment status is not yet known. Let λ be the proportion of all first-period workers who are employed at hours-adjustment firms. For a worker who does not yet know his first-period employment status, λe is the probability that he will be employed in the first period at an hours-adjustment firm.

Let l_E be the probability of layoff from an employment-adjustment firm. Since μ_i is a proportional shock, the probability of layoff for a randomly chosen worker at firm i is just $-\mu_i$ if μ_i is in the interval $[-1, 0]$, and zero otherwise. l_E is then the average of $-\mu_i$ over that interval:

$$l_E \equiv \int_{-1}^{0} -\mu \, \mathrm{d}F(\mu) > 0.$$

Workers can never be laid off from hours-adjustment firms. The average layoff rate, l, used to calculate the hiring rate in (1) is therefore

$$l = (1 - \lambda) l_E. \tag{2}$$

A worker's state in any period is denoted U, E or H: unemployed, employed in an employment-adjusted firm, or employed in an hours-adjustment firm. This gives five possible states for any worker over the two periods: $\{UU, UE, EU, EE, HH\}$. The probabilities of each state depends on e, l_E, h and λ. It is convenient to define the *permanent separation rate*, s, as the probability that a worker employed in the first period ends up unemployed in the second,

$$\begin{aligned} s &= l(1 - h) \\ &= \frac{(1 - e)l}{(1 - e) + el}. \end{aligned} \tag{3}$$

Table 1 gives the probability of each state and the hours worked in each.

Since the wage and disutility of work are both constant by assumption, we use the normalization that $w - v = 1$. The utility for each worker is then $U(H_1 + H_2)$. Define $V(\lambda)$ as the expected utility of a worker yet to enter the

TABLE 1

State	Probability		Hours
UU	$(1-e)(1-h)$	$=1-e(1+s)$	0
UE	$(1-e)h$	$=es$	1
EU	$e(1-\lambda)l_E(1-h)$	$=es$	1
EE	$e(1-\lambda)[1-l_E(1-h)]$	$=e(1-\lambda)-es$	2
HH		$=e\lambda$	$2+\mu$

workforce when the proportion of employed workers in hours-adjustment contracts is λ. Using Table 1, we have

$$V(\lambda)=(1-e(1+s))\ U(0)+2es\ U(1)+e(1-\lambda-s)\ U(2) + e\lambda\{E[U(2+\mu)]\}, \tag{4}$$

where

$$E[U(2+\mu)]=\int_{-1}^{\infty} U(2+\mu)\ \mathrm{d}F(\mu).$$

From (2) and (3), an increase in λ leads to a lower average layoff rate and thus a lower permanent separation rate. This generates the principal result: the reduction in labour market turnover implied by more widespread adoption of job security (more hours adjustment) provides worse risk-sharing to a worker who does not yet know his first-period employment status.

Theorem 1. Any risk-averse worker yet to enter the workforce has expected utility which is decreasing in λ.

Proof. The last two terms of (4) can be rewritten so that $V(\lambda)$ becomes

$$V(\lambda)=[1-e(1+s)]\ U(0)+2es\ U(1)+e(1-s)\ U(2) - e\lambda\{U(2)-E[U(2+\mu)]\}. \tag{5}$$

Differentiating (5) with respect to λ gives

$$V'(\lambda)=e\frac{\partial s}{\partial \lambda}\{[U(1)-U(0)]-[U(2)-U(1)]\}-e\{U(2)-E[U(2+\mu)]\}.$$

The strict concavity of U and the zero-mean assumption on F implies that both terms in brackets are positive. The result then follows from $\partial s/\partial\lambda<0$. □

In saying that hours adjustment provides worse risk-sharing for workers than employment adjustment, we are not referring to the form of risk-sharing common to implicit contract models (e.g. Azariadis 1975, Baily 1974 or Rosen 1985). Here, the sharing of risk is between the employed and unemployed workers rather than between workers and firms.

Incorporating this more familiar form of risk-sharing into our model, however, provides one interpretation of Theorem 1. Consider two regimes, E and H, where regime E has a greater amount of employment adjustment than regime H. Let H' refer to a hypothetical regime in which the same proportion of firms use hours adjustment as in regime H, but where the workers at those firms have their net income completely insured against the μ shocks. The only

change this makes to our model is that the last term in (5) is zero. The change in the lifetime income distribution from regime E to regime H' is then just a mean-preserving spread (q.v. Rothschild and Stiglitz 1970) resulting from the reduction in the permanent separation and hiring rates. A move from H' to H then removes the income insurance and so addes more mean-preserving noise to the distribution of lifetime income. For risk-averse workers, both mean-preserving spreads in the distribution of lifetime income lead to a reduction in expected utility.

Theorem 1 shows that job security may be detrimental to workers overall, even if its provision does not result in lower wages or higher unemployment. In the absence of legislation, however, the level of job security in the labour market is determined not by the preferences of workers overall, but in contracts made between individual firms and their workers. One interpretation of Theorem 1 is that it describes an externality from employed to unemployed workers. But, since currently employed workers may become unemployed in the future, they also benefit from being in an economy with high turnover. In other words, the job security externality runs not only from the contract chosen by workers at one firm to unemployed workers, but also to employed workers at other firms. We consider this aspect of the job security externality in the next section.

III. The Choice of Contract

Even if it is costly for a firm to provide job security, it is efficient for it to do so if these costs are less than the benefits to workers. But presumably the wage would adjust to reflect these costs. In modelling the contract choices of employed workers and firms, we are therefore led to consider the effect that job security has on wages and unemployment.

Unemployment

We have assumed a constant employment rate across the two periods. This permits us to focus on the long-term implications of job security for labour market turnover, abstracting from issues of short-term business cycles. Our results do not depend on this simplification. The assumption that the employment rate is independent of the degree of turnover is more important, as it guarantees that the hiring rate will increase with the layoff rate when more firms adopt employment-adjustment contracts. It is this relationship between turnover and the hiring rate that generates the job security externality.

Let the employment rate now depend on turnover. Equation (1) still describes the steady-state condition relating the hiring rate to the layoff rate, but the employment rate is now a function of l:

$$h = \frac{l\,e(l)}{1 - e(l) + l\,e(l)}. \tag{6}$$

Although an increase in the flow of layoffs requires an increase in the flow of hires in steady state, there need not be an increase in the hiring rate if the stock

of unemployment also rises—that is, if $de/dl<0$. From (6),

$$(7) \qquad \frac{dh}{dl}>0 \quad \text{if and only if} \quad \frac{de}{dl}l>-e(1-e).$$

Letting $u=(1-e)$ be the unemployment rate, (7) gives

$$(8) \qquad \frac{dh}{dl}>0 \quad \text{if and only if} \quad \frac{du}{dl}\frac{l}{u}<e.$$

That is, an increase in the layoff rate will lead to an increase in the hiring rate as long as the proportionate increase in the unemployment rate is sufficiently small. Of course, for this condition to hold, it is sufficient that an increase in the layoff rate reduces unemployment.

The preference of employed workers

Let the wage paid in employment-adjustment contracts be w_E, and let there be a wage differential, δ, on hours-adjustment contracts so that $w_H=w_E-\delta$. We continue to use the normalization that $w_E-v=1$. The expected utility of a worker employed in period 1 with an employment-adjustment contract is then

$$l_E(1-h)\ U(1)+[1-l_E(1-h)]\ U(2),$$

and in an hours-adjustment contract it is

$$E\{U[(2+\mu)(1-\delta)]\}.$$

Define δ_w as the maximum wage differential a worker would be prepared to accept in an hours-adjustment contract; that is, δ_w is the solution to

$$(9) \qquad l_E(1-h)\ U(1)+[1-l_E(1-h)]\ U(2)=E\{U[(2+\mu)(1-\delta_w)]\}.$$

An increase in the hiring rate lowers the expected cost to the worker of being exposed to the higher layoff risk in an employment-adjustment contract; consequently, there is a fall in the wage differential that workers are willing to pay to insure against this risk. Furthermore, the hiring rate is affected by the proportion of firms using hours-adjustment contracts, and so δ_w is a function of λ. We therefore define $\delta_w(\lambda)$, which describes the preferences of employed workers as a function of the amount of turnover in the economy.

Theorem 2. If $dh/dl>0$, then δ_w is an increasing function of λ.

Proof. The derivative of δ_w with respect to λ is

$$\frac{\partial\delta_w}{\partial\lambda}=\frac{\partial\delta_w}{\partial h}\frac{\partial h}{\partial l}\frac{\partial l}{\partial\lambda}.$$

From equation (9), $\partial\delta_w/\partial h<0$ and from equation (2), $\partial l/\partial\lambda<0$.

The preference of firms

Given the desire that workers have for job security, the observation that job security is not a feature of all labour contracts suggests that the provision of job security must be costly to at least some firms.[3]

There are several reasons why firms might not be indifferent between employment-adjustment and hours-adjustment contracts. Most payroll tax systems generate fixed costs for workers (e.g. Fitzroy and Hart 1985, and Burdett

and Wright 1989), giving firms a preference for employment-adjustment contracts. On the other hand, hours-adjustment contracts permit the firm to retain valuable workers, and thus, when workers possess firm-specific human capital, firms might actually prefer hours-adjustment contracts. Explicit turnover costs would also lead firms to prefer hours-adjustment contracts (Baily 1977). More generally, as Feldstein (1976) has argued, the firm's technology may be such that the composition of labour input between the number of workers and hours per worker affects output; the firm's preference over contract types then depends on the sign of the cross-partial derivative between hours and employment in the production function.

Let δ_f denote the wage differential for a particular firm, representing a minimum value of $w_E - w_H$ which leads it to prefer hours-adjustment contracts; that is, δ_f represents the cost to the firm of providing job security. δ_f can be positive or negative, and can differ across firms. Let G be the distribution function of firms, so that $G(\delta)$ is the proportion of firms for which $\delta_f \leq \delta$: that is, it is the proportion of firms that would be willing to offer hours-adjustment contracts at a wage differential of δ. Since G is a distribution function, it is non-decreasing in δ.

Equilibrium

Consider a wage differential for workers, δ_w. It is efficient for a firm to provide its workers with an hours-adjustment contract if and only if the benefit to workers exceeds the cost of its provision—that is, if $\delta_w > \delta_f$. Note that it does not matter how the surplus is split between workers and firms: if bargaining is efficient, then the proportion of firms offering hours-adjustment contracts will be $G(\delta_w)$. But the workers' wage differential depends on turnover and thus depends on this proportion. An equilibrium is therefore a λ^* such that

$$\lambda^* = G(\delta_w(\lambda^*)).$$

Figure 1 illustrates an equilibrium, where $\delta_w(\lambda)$ is plotted from the horizontal to the vertical axis, and $G(\delta)$ is plotted from the vertical to the horizontal axis.

Analysis

We have described the turnover externality as extending from the contract choice of workers at any firm to all other workers in the economy. It is this externality that is described by the relationship between δ_w and λ. Note that, if δ_w is an increasing function of λ, then the provision of job security at a positive measure of firms makes it more likely that it will be provided at any other firm. An immediate corollary of Theorem 2 is therefore the following.

Corollary. If $\mathrm{d}h/\mathrm{d}l > 0$, then the provision of job security in one firm is a strategic complement to that in others.

This strategic complementarity has two implications. The first is that government policies designed to increase job security operate with a multiplier effect. Imagine that the government introduces legislation that increases the cost to firms of offering employment-adjustment contracts. If such legislation is to be binding, it must reduce the *relative* cost to firms of offering hours-adjustment contracts; that is, it must reduce δ_f. This would appear in Figure

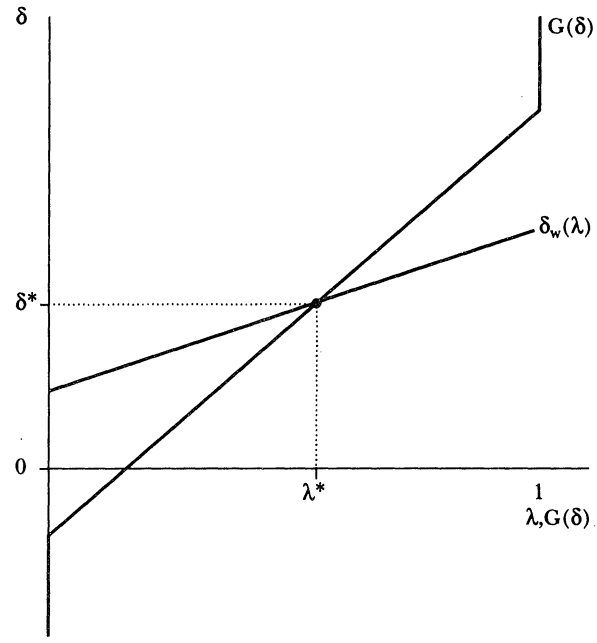

FIGURE 1. Equilibrium when $dh/dl > 0$

1 as a shift down in the $G(\delta)$ locus. The immediate effect of the policy is to increase the number of firms providing job security at the wage differential δ^*. But as λ increases, so does $\delta_w(\lambda)$, inducing more firms to offer job security. Depending on the relative slopes of $G(\delta)$ and $\delta_w(\lambda)$, the overall effect may be such that small changes in government policy have a large effect on the amount of job security provided.

The strategic complementarity also suggests the possibility of multiple equilibria (cf. Cooper and John 1988), providing one interpretation of the often-cited difference between European and North American labour markets. Observed differences in layoff rates and in the extent of hours adjustment may simply reflect different equilibria into which the two continents have settled, rather than any intrinsic differences between the two. There are obviously several institutional differences between Europe and North America that affect the types of contracts offered, so we would not want to push this interpretation too far.

One additional implication of the existence of multiple equilibria is that it can be responsible for hysteresis in the labour market. Temporary policies may then have permanent effects.

IV. DISCUSSION

The job security externality that drives our analysis depends on two things being true about labour markets. The first is that workers strictly prefer employment to unemployment, and the second is that an increase in the average layoff rate results in an increase in the hiring rate. The first seems self-evident, but

the positive relationship between the layoff and hiring rates is less obvious. We now examine this relationship.

An increase in the layoff rate will generate an increase in the hiring rate as long as du/dl is not too large (equation (8)). The theoretical literature, however, does not provide an unambiguous sign for du/dl. For example, in search and matching models such as Pissarides (1990) and Blanchard and Diamond (1990), an exogenous matching function that takes unemployment and vacancies as inputs is responsible for bringing workers and firms together. A greater flow of separations requires a greater flow of hires and so typically results in a greater stock of both unemployment and vacancies. The effect of greater turnover on the hiring *rate* then depends on the returns to scale of the matching function.

Whether an increase in turnover actually leads to an increase in the hiring rate is ultimately an empirical question. Figure 2 provides some direct evidence for G-7 countries. High turnover reflects both a high separation rate, $s=S/E$, and a high accession rate, $a=H/E$, where S and H are the monthly flows of separation and hires, respectively, and E is the stock of employment. Although in steady state the flow of separations must equal the flow of hires, this need not be true over the business cycle. To obtain a measure of turnover that is reasonably independent of the business cycle, we construct a turnover rate that is the simple average of s and a. The hiring rate, h, is given by

$$h=H/U=a[(1-u)/u] \tag{10}$$

where u is the unemployment rate. For a measure of h that abstracts from cyclical variation as much as possible, we use our constructed turnover rate in place of a in (10).[4]

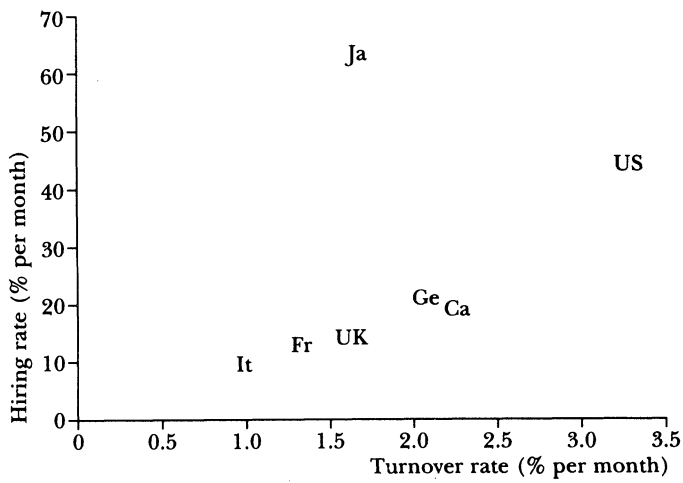

FIGURE 2. Turnover and hiring rates in G-7 countries

The positive relationship between the turnover and hiring rates in Figure 2 is clear, especially if Japan is omitted from the sample. Given the widespread belief that the 'discouraged worker' phenomenon is more prevalent in Japan than in other countries, leading to a downward bias in measured unemployment and hence to an upward bias in the estimated hiring rate, the comparison between North America and Europe may indeed be the most relevant (see

Tachibanaki 1987). Obviously, this is too small a sample on which to base strong conclusions, but it does suggest that our assumption in Section III that hiring and layoff rates move together is consistent with available data, and thus provides reasonable grounds for believing there may be a negative externality associated with the provision of job security.

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NOTES

1. In a previous version of this paper, we allowed the rehire probability of laid-off workers to be different from the hiring probability of workers who were unemployed in period 1, with both depending on overall labour market turnover. To lighten the notation, we have assumed here that the two rates are the same; this simplification does not affect any of the results.
2. It is not crucial that $w-v$ be constant. All the results carry through as long as the marginal wage and disutility of labour are such that U is increasing and concave in the number of hours worked.
3. It does not follow automatically in our model that $\delta_w(\lambda)$ is always positive. It is possible to create examples where the rehire probability is so high that a risk-averse worker would rather take the risk of being laid off than accept the uncertainty in income that is implied by hours adjustment. Even in the model, however, this is an extreme case.
4. For reasons of data availability, the year varies across the seven countries. For Canada, France, Italy and the United States the year is 1981, for Germany 1982, for Japan 1983 and for the UK, 1984. Data on a and s is from Tachibanaki (1987). The unemployment rate used is the 1985 OECD standardized unemployment rate, from OECD *Main Economic Indicators* (1987).

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