WORKING PAPERS

THE MICRO-FOUNDATIONS OF LAYOFFS

AND LABOUR-HOARDING

by

J. L. Whiteman

No. 47 November 1980

IN ECONOMICS

DEPARTMENT OF ECONOMICS

UNIVERSITY OF SYDNEY

THE MICRO-FOUNDATIONS OF LAYOFFS

AND LABOUR-HOARDING

by

J. L. Whiteman

No. 47 November 1980

National Library of Australia Card Number and ISBN

0 86837 023 1

I would like to express my appreciation to Dr A. J. Phipps and other members of the Labour Economics Group, University of Sydney, for helpful suggestions and encouragement during the course of this project. I also wish to express my gratitude to the Commonwealth Public Service Board for providing the scholarship which enabled me to undertake the following analysis. Needless to say, I claim sole responsibility for all the errors and omissions in this paper.

THE MICRO-FOUNDATIONS OF LAYOFFS AND LABOUR-HOARDING

Pulman : 'When all the world is lying, only an idiot tells the truth'
(Mackie 1976, p.42)

Eve : 'You've got to have a little bit of truth as the foundation for your lies'
(Mackie 1976, p.52)

Up until the last two decades, economic theory paid little attention to the role of turnover in the labour market. Subsequently with the emergence of human capital theory and the development, more recently, of job-search theory, the theory of labour turnover is coming to occupy a central position in the rapidly expanding field of analytical labour economics. The emergence of this latent emphasis on the economics of labour turnover has, perhaps, been stimulated by the current quest for an explanation of the differential incidence of employment and unemployment.[1]

Conventional neoclassical theory is based firmly on the proposition that equality is ultimately achieved, in a competitive labour market, between the wage paid by the firm and the marginal value product of its workforce. As a result both product and labour markets clear and consequently no economic costs or benefits will be associated with labour turnover. Moreover since there is, all else being equal, a single market clearing wage, then the existence of unemployment or its inverse, labour hoarding, can only be explained in terms of institutional constraints on the flexibility of wages or prices or on factor mobility.[2]

Human capital theory, developed largely within this neoclassical framework, introduced the notion of firm-specific, on-the-job training in a belated attempt to explain the differential turnover experience of particular ethnic, demographic and racial groups within the labour-force.[3] The introduction of the concept of firm-specific human capital implied that, ceteris paribus, labour is viewed as heterogeneous within the internal labour market of the firm but homogeneous in the external labour market.[4] In other words, although the wage paid to employees with firm-specific training will tend to vary from firm to firm in accordance with the level of that training, the wage offered to new accessions with no training specific to a particular firm will, accordingly, tend to be the same across firms, all else being equal. Thus the notion of a single market clearing wage is also implicit in human capital theory and consequently the outcome, in-so-far as unemployment and labour turnover is concerned, is little different from that of neoclassical theory. The introduction of the concept of firm-specific training, however, does provide a potential explanation of the tendency of firms to hoard experienced labour during a cyclical downturn.[5] On the other hand, it is a logical implication of the specific human capital hypothesis that wages paid in the internal labour market will exceed wages offered in the external labour market. Thus there is no incentive for employees to search for alternative more remunerative positions in other firms. In other words, it is a clear implication of human capital theory that all inter-firm labour mobility is involuntary.[6]

Job-search theory is based on the assumption that individuals voluntarily forego employment in order to search for alternative, more remunerative employment.[7] As a result, firms are able to exercise 'dynamic monopsony power' and hence wage offers vary from firm to firm.[8] Thus it is a necessary consequence of the search-analytic framework that wages are not necessarily market clearing. This result represents a major landmark in the development of analytical labour economics in that it provides a potential theoretical explanation of what has been widely regarded as an empirical fact. However while search theory does provide a tentative explanation of the emergence of unemployment, it is a logical implication of this analytical framework that all unemployment and all labour turnover is purely voluntary.[9] As with conventional neoclassical and human capital theory, the existence of involuntary unemployment, that is layoffs, can only be explained in terms of market imperfections or institutional constraints on the flexibility of wages or on the mobility of labour.

This paper presents an alternative explanation of wage and employment dynamics in which layoffs and labour hoarding during cyclical downturns represent manifestations of firms behaving optimally within a given economic environment, rather than the result of exogenous market imperfections. The resulting analysis represents a significant departure from the established precepts of human capital and job-search theory, and yet is still sufficiently general to yield many of the neoclassical, human capital and job-search outcomes as special cases. In particular the notions of firm-specific human capital and search-unemployment have no role within the following analytical framework. This is not to deny that firm-specific training and search-unemployment may exist within the labour market, but merely to demonstrate that similar and perhaps more intuitively appealing theoretical outcomes can be derived in the absence of these particular assumptions which currently form the basis of the continuing human capital research programme and the foundation of modern economic explanations of labour turnover and the emergence of unemployment at the micro-level.

Section I of this paper outlines the basic underlying assumptions in respect of the supply of labour to a firm and the accumulation of human capital. In Section II a microeconomic model of wage and employment dynamics is derived from these assumptions. Section III applies the conclusions derived from the model to an analysis of the response of a firm to cyclical fluctuations in economic activity. Section IV provides a summary and some conclusions.

I Human Capital and Labour Supply

For the purposes of the present analysis, labour is differentiated solely in terms of workforce experience. It is assumed that individuals increase their productive efficiency by 'learning by doing' so that the productivity of a particular individual is correlated with the length of his workforce experience.[10] Moreover, towards the end of an individual's effective working life there is a decline in productive efficiency which is the net result of physical deterioration and an age-related decline in learning ability.[11]

On the assumption that 'every man has his price', the potential supply of labour available to a firm is every person able to work. This includes experienced labour, that is the employed and unemployed, as well as inexperienced labour, that is school-leavers and others who may be induced to enter the labourforce.[12] It is assumed that the supply of inexperienced labour is infinitely elastic so that the firm always has the option of supplementing its existing workforce with individuals with little or no prior workforce experience. However, employment of inexperienced labour is costly in terms of supervision. The major cost is the resultant decline in the productivity of experienced employees who become involved in supervising these new entrants to the workforce.[13]

We assume that individuals differ in their attitude towards risk so that a given wage offer may have a differential impact on individuals of given workforce experience. However, the variance of the aggregate response will tend to increase with the strength of the wage stimulis. Thus an extremely high wage offer will tend to generate more acceptances than rejections while the reverse holds for an extremely low wage offer.

In addition, the acceptance and rejection rates will depend on the period over which the offer is effective as well as the rate of diffusion of information regarding the wage offer. For the purposes of the present analysis it is assumed that the rate of diffusion of information in a given period is also a positive function of the intensity of the wage stimulis.

Individuals are, however, risk averse, so that the perceived strength of the stimulis will diminish if the firm is at the same time laying off labour. In other words, all else being equal, the firm that implements a layoff policy will tend to experience difficulty in both attracting and retaining experienced labour.[14]

Let ϕ represent a proportional wage premium offered by the firm to experienced labour[15] and S be an index representing the aggregate productive efficiency (average workforce experience) of the firm's workforce. The representative (average) wage offered by the firm is represented as follows:[16]

$$\frac{W}{L} = w(\phi, S) \qquad (1)$$

$$w_{\phi} > 0, \; w_S > 0, \; \phi \gtrless 0 \text{ and } S \geq 1$$

where W represents the total wage bill
and L represents labour.

The net flow of experienced labour to the firm is defined as a positive function of the wage premium offered by the firm and an inverse function of the firm's layoff policy, i.e.:

$$Q = Q(\phi, \ell) \qquad (2)$$

$$Q \gtrless 0, \; Q_{\phi} > 0, \; Q_{\ell} < 0$$

where Q represents the net flow of experienced labour,[17]
and ℓ is the number of layoffs during the period.

The rate of change in employment is defined as the sum of new inexperienced accessions and the net flow of experienced labour, less layoffs, retirements and other discharges, i.e.:

$$\dot{L} = N + Q(\phi, \ell) - \ell - \delta L \qquad (3)$$

where N is the number of inexperienced accessions

and δ represents the retirement and disciplinary discharge rate.

The rate of change in aggregate labour efficiency (human capital) is a positive function of the net flow of experienced accessions and an inverse function of the number of inexperienced accessions during the period, i.e.:

$$\dot{S} = f(\phi, \ell, N) \qquad (4)$$

$$f_{\phi} > 0, \ f_{\ell} < 0, \ f_{N} < 0$$

In other words, for the firm, the rate of accumulation of human capital (aggregate productive efficiency) depends on its ability to attract and to retain experienced labour.[18]

II Wage and Employment Dynamics

Assuming a conventional neoclassical production function where the role of physical capital is ignored for reasons of analytical convenience, then output is defined solely in terms of labour inputs measured in efficiency terms, i.e.:

$$X = X(SL) \qquad X' > 0, \ X'' < 0 \text{ and } X \leq X^* \qquad (5)$$

where X' the first derivative represents the marginal product of inexperienced labour,

and X* represents the output constraint.[19]

Let q be the price per unit of output, p the general price level, ρ the market discount rate and t time so that the firm's objective is to maximise net worth, i.e.:[20]

$$\text{Max} \int_0^\infty \frac{1}{p} \{q\ X(SL) - w(\phi, S)L\} e^{-\rho t}\ dt \tag{6}$$

$$\text{subject to} \quad \dot{L} = N + Q(\phi, \ell) - \ell - \delta L$$

$$\dot{S} = f(\phi, \ell, N)$$

$$X \leq X^*$$

$$\ell \geq 0 \text{ and } N \geq 0.$$

Let π, γ and θ denote the monetary value of increases in employment, aggregate labour efficiency and output respectively so that the corresponding Hamiltonian function is defined as follows:

$$H = \{q\ X(SL) - w(\phi, S)L + \pi[N - \ell + Q(\phi, \ell) - \delta L] + \gamma f(\phi, \ell, N) + \theta[X^* - X(SL)]\}\frac{e^{-\rho t}}{p} \tag{7}$$

The first-order conditions that must hold at all times along the firm's optimal path are as follows:

$$N \geq 0, \quad \pi \leq - \gamma f_N \text{ and } N(\pi + \gamma f_N) = 0 \tag{8}$$

$$\ell \geq 0, \quad \pi \geq \gamma f_\ell/(1 - Q_\ell) \text{ and } \ell[\pi(Q_\ell - 1) + \gamma f_\ell] = 0 \tag{9}$$

$$\pi = (w_\phi L - \gamma f_\phi)/Q_\phi \tag{10}$$

$$\theta \geq 0, \quad X \leq X^* \text{ and } \theta(X^* - X) = 0 \tag{11}$$

Equation (8) states that the firm will take on inexperienced labour so long as their net marginal contribution to profits exceeds the resulting marginal increment to supervisory costs. Thus the equilibrium condition is that the shadow price (monetary value) of the last inexperienced accession must equal the marginal increment in terms of total supervisory costs.

As suggested above the neoclassical, human capital and job-search models can be interpreted as special cases of the present model. For instance, in the human capital model only firm-specific training is financed by the firm. Accordingly, equation (8) would be interpreted as suggesting that the firm would only take on new accessions so long as their net marginal contribution exceeds the cost of firm-specific on-the-job training. In neoclassical and job-search theory, labour is usually assumed to be homogeneous in production. In the present framework this assumption would be imposed by setting $\gamma = 0$, so that (8) reduces to the following condition:

$$N \geq 0,\ \pi \leq 0 \text{ and } N\pi = 0$$

In words, the firm will take on new accessions so long as their net marginal contribution exceeds zero.

Equation (9) suggests that the optimally behaving firm will layoff employees if the decline in aggregate productive efficiency per unit of labour displaced or repelled by the layoff program is greater than the net marginal contribution of inexperienced labour. Intuitively the equilibrium condition is that the shadow price (monetary value) of laying-off the next worker will equal the marginal cost of firing that worker (i.e. the monetary value of the resulting reduction in the efficiency of the firm's workforce stemming from the adverse impact of the layoff on the net flow of experienced labour to the firm). At face value (9) is an extremely difficult condition to interpret and accordingly is best taken in discrete steps.

Assume for the moment that the monetary value of an increase in employment (π) is zero. Then from (9) it follows that the optimally behaving firm will layoff employees so long as $\gamma f_\ell > 0$, that is, as long as the monetary value of an increase in aggregate productive efficiency (γ) is less than zero. In other words, under this restriction, the firm will only layoff employees if the res[ult] is non-detrimental in terms of aggregate labour efficiency, i.e. $\gamma \leq 0$.

Now consider the case where labour is assumed to be homogeneous in production i.e. $\gamma = Q_\ell = 0$. Equation (9), under this assumption, reduces to the following familiar condition:

$$\ell \geq 0 : \pi \geq 0 \quad \text{and} \quad \pi\ell = 0$$

In other words, if employees have any value in increasing profitability, they should not be laid off. This result reflects the conventional neoclassical, human capital and job-search explanation of the existence of layoffs given institutional constraints on the downward flexibility of wages.[21]

In our general case $\pi \neq 0$ and $\gamma \neq 0$. Thus if $\gamma > 0$ then (9) implies that the monetary value of an increase in employment (π) must become significantly negative before the optimally behaving firm would contemplate laying off employees. Hence in terms of this model, layoffs and labour hoarding go hand in hand. Thus even though a firm is laying off labour, it would still maintain a stock of labour in excess of its immediate requirements in anticipation of prospective long-term gains in the future. In other words, the firm places a positive value on the experience of its residual workforce and on its reputation as a secure employer.[22] However, as the recession deepens the firm may revise its valuation downwards and thus release more of its experienced labour. Faced with imminent bankruptcy, the firm may have no regard for its existing workforce or its reputation and behave, like the neoclassical, human capital and job-search firms discussed above; as if $\gamma = 0$.

$\gamma < 0$ implies a particularly extreme case where experienced employees have become a liability to the firm and consequently will be laid off even though the monetary value of an increase in employment (π) exceeds zero. Such a case could arise if, for instance, a government subsidised the employment of inexperienced labour or school-leavers. Thus, given such a policy, the optimally behaving firm could layoff experienced workers when $\pi > 0$ and take on inexperienced labour when $\pi < 0$. It is clear that such a policy could have a severely disruptive impact on workforce efficiency leading to a rather perverse hoarding of inexperienced labour. Accordingly, for the purposes of the present analysis, it is assumed that such intervention does not occur and that γ is typically greater than or equal to zero.

Given (8) and (9) it is easily shown that $\ell > 0$ and $N > 0$ implies a contradiction so that there are only three legitimate outcomes in so far as layoffs and inexperienced accessions are concerned. These outcomes are represented by the following three cases:

$$\begin{array}{ccccc} \text{Case 1} & & \text{Case 2} & & \text{Case 3} \\ \left\{\begin{array}{l} N > 0 \\ \ell = 0 \end{array}\right\} & \text{or} & \left\{\begin{array}{l} N = 0 \\ \ell > 0 \end{array}\right\} & \text{or} & \left\{\begin{array}{l} N = 0 \\ \ell = 0 \end{array}\right\} \end{array} \qquad (12)$$

In other words, the optimally behaving firm does not layoff experienced labour and take on inexperienced labour in the same time period.[23]

Equation (10) suggests that the firm will continue to increase or decrease the proportional premium (ϕ) until the net marginal benefit or cost equals zero. For instance, if the marginal costs of experienced employees, in terms of the total wage bill, exceeds their marginal contribution to the firm's objective, then the wage premium will be lowered and vice versa until marginal costs and benefits of the voluntary flow of experienced labour, into and out of the firm, are brought to equality.

Taken in conjunction with conditions (8) and (9), equation (10) yields further implications in terms of the allocation of available employment opportunities between experienced and inexperienced labour. These implications are best summarised in terms of the three outcomes derived in (12) above.

Case 1 : $N > 0$ and $\ell = 0$ i.e. $\pi = -\gamma f_N > 0$

In this case the firm will increase ϕ until the marginal increment to the total wage-bill equals the marginal contribution to profitability of the ensuing inflow of experienced accessions. Moreover the equilibrium conditions imply that the net marginal cost of attracting the last experienced accession should equal the marginal cost of employing the last inexperienced accession.

In other words, the equilibrium conditions suggest that the marginal contributions of experienced and inexperienced labour to the firm's objective will ultimately be brought to equality.

Case 2 : $N = 0$ and $\ell > 0$ i.e. $\pi = \gamma f_\ell/(1 - Q_\ell) < 0$

In this case the firm will decrease ϕ until the marginal benefits, in terms of the reduction of the total wage bill, equal the marginal costs in terms of the net flow of experienced labour. Together (9) and (10) imply that the net marginal cost of the last 'voluntary quit' should equal the marginal cost of the last 'layoff'.

Case 3 : $N = 0$ and $\ell = 0$ i.e. $\gamma f_\ell/(1 - Q_\ell) < \pi < - \gamma f_N$

In this case the firm simply equates the marginal costs and benefits of varying ϕ.[24]

Equation (11) simply places a monetary valuation on the existence of an output constraint. In this model, the price of output is exogenous and consequently the impact of any output constraint is similar in effect to a decrease in product price q. In other words, the effective price becomes q*, i.e. $q - \theta$. In the event that prices are market-clearing or the firm is unconstrained in respect of output, then θ equals zero and the effective price q* is identical to the nominal price q.

The following transition equations identify the determinants of the rate of change in the monetary value of an increase in employment and aggregate labour efficiency respectively:

$$\dot{\pi} = w - q^* X'S + (\delta + \rho + \frac{\dot{p}}{p})\pi \qquad (13)$$

$$\dot{\gamma} = (w_s - q^* X')L + (\rho + \frac{\dot{p}}{p})\gamma \qquad (14)$$

Rearranging (13) yields the following relationship between the average value of the wage paid and the experience-augmented marginal product of labour.

$$q^* X'S - w = \{\rho - \frac{\dot{\pi}}{\pi} + \delta + \frac{\dot{p}}{p}\}\pi \tag{15}$$

In other words, an optimally behaving firm may offer a wage above, below or equal to the value of the marginal product of labour depending on the current monetary value of an increase in employment (π).[25] The three possible outcomes summarised by (12) are discussed in detail below:

Case 1 : $N > 0$ and $\ell = 0$

In this case π represents the marginal cost in terms of aggregate labour efficiency of employing an additional inexperienced employee. π can thus be interpreted as the implicit outlay by the firm on an additional inexperienced accession.

Interpreted in this light (15) suggests that the firm, which takes on inexperienced labour, pays a wage below the value of the marginal product of labour. The difference reflects the imputed nominal interest on the implicit outlay (π), a return to compensate for losses due to retirement and disciplinary discharges as well as an adjustment for variations in π over time.

In the sense that the firm derives a return on its implicit outlay, this result might be interpreted as reflecting the 'self investment' hypothesis of Becker.

Case 2 : $N = 0$ and $\ell > 0$

In this case (15) yields the result that a firm, which is laying off labour, pays a wage in excess of the value of the marginal product of labour. This result is a natural consequence of our earlier result that labour hoarding and layoffs represent the simultaneous outcome when a firm experiences a significant contraction of product demand. In terms of this analytical framework, therefore, the emergence of 'wage overhang' could be considered a manifestation of firms behaving optimally within a depressed economic environment rather than evidence of excessive union presence as is commonly suggested.

Case 3 : $N = 0$ and $\ell = 0$

In this case (15) suggests that the wage may be slightly above, below or equal to the value of the marginal product of labour depending upon the current value of increasing employment (π). When $\gamma f_{\ell}/(1 - Q_{\ell}) < \pi < 0$, the firm pays a wage in excess of the value of the marginal product of labour, thereby implying the existence of labour hoarding in the absence of layoffs. When $0 < \pi < -\gamma f_N$, the firm pays a wage below the value of the marginal product of labour but still experiences a net flow of experienced labour sufficient to fulfil its current labour requirements. Only when π equals zero will the wage equal the value of the marginal product of labour.

Rearranging (14) yields the following relationship:

$$q^* X'L - w_s L = (\rho - \frac{\dot{\gamma}}{\gamma} + \frac{\dot{p}}{p})\gamma \tag{16}$$

Equation (16) is interpreted in a similar manner to (15) although unlike the latter, (16) does not have intuitive parallels in conventional neoclassical theory. The first term on the left-hand side represents the value of the marginal product of aggregate labour efficiency while the second term represents the value of the marginal variation in the total wage-bill with respect to a change in the level of aggregate labour efficiency (S). Thus for $\gamma > 0$, the equilibrium condition (16) simply suggests that the value of the marginal product of efficiency (S) exceeds the marginal cost of efficiency in terms of the total wage-bill by an amount which reflects the firm's implicit outlay on aggregate labour efficiency. The difference reflects the nominal interest on the implicit outlay (γ) with an adjustment for variations in the value of an increase in aggregate labour efficiency over time.

In the case where γ equals zero, (16) simply suggests that the firm equates the value of the marginal product and marginal cost of efficiency.

Thus (15) represents the transition equation governing the rate of change in employment and (16) the equation governing the rate of accumulation of human capital or aggregate labour efficiency.

The conditions outlined above represent the basic parameters within which the firm adjusts both the quantity and quality of its workforce in response to given variations in the economic environment or in response to specific fluctuations in its prospects due, perhaps, to shifting tastes and preferences or significant shifts in its competitive position vis-a-vis other firms in the industry.

III The Process of Adjustment

In this section the firm's reaction to expansions and contractions in demand are considered in the light of the model developed in the previous sections. An expansion of demand is represented either as a relaxation of the output constraint leading to a rise in the effective price q* or an exogenous rise in the nominal price of output q where the firm has no constraint on output. Likewise a contraction in demand is represented by a decrease in q* reflecting a decline in the nominal price of output or a tightening of the output constraint.

In order to illustrate the adjustment process let:

$$y(N, \gamma) = -\gamma f_N \tag{17}$$

$$g(\phi, \gamma) = (w_\phi L - \gamma f_\phi)/Q_\phi \tag{18}$$

and

$$h(\ell, \gamma) = \gamma f_\ell/(1 - Q_\ell) \tag{19}$$

It is assumed, purely for expositional purposes, that initially the firm's expectations regarding the future are such that it has no incentive to either increase or decrease its current level of employment. In other words, the value of an increase in employment (π_0) is zero. The first order conditions hold so that $y_0 > 0$, $h_0 < 0$ and $g^*_0 = 0$. As illustrated in figures 1 and 3, the firm in this state has no incentive to either layoff employees or to take on inexperienced employees. In other words by setting the proportional wage premium at ϕ_0 (figure 2), the firm promotes a positive net inflow of experienced labour sufficient to offset voluntary departures, retirements and disciplinary discharges.

Now assume there is a slight expansion in product demand. The immediate impact of an increase in $q*$ via (13) and (14) is a rise in the monetary value of an increase in employment (π) and a corresponding rise in the monetary value of an increase in aggregate labour efficiency (γ) respectively. In figures 1 to 3 the former is represented as an increase in the value of π from π_0 to π_1 while the latter is represented as an upward shift of y to the left (i.e. from y_0 to y_1), a downward shift of g to the right (i.e. from g_0 to g_1) and a downward shift of h to the left (i.e. from h_0 to h_1). In other words, the firm can obtain a positive return from a modest increase in output given that $0 < \pi < y$; $h < \pi$ and $g* = \pi$. However, since the marginal cost of supervising inexperienced accessions exceeds the potential benefit of expanding employment, the optimal action for the firm is not to take on inexperienced accessions but to increase the proportional wage premium from ϕ_0 to ϕ_1, thereby detering voluntary quits and increasing the net flow of experienced labour into the firm. This course of action avoids the implicit outlay associated with the employment of inexperienced labour although it does necessarily involve an across-the-board increase in the firm's wage-rate. This has a three-pronged effect, that is an increase in the size of the labour queue available for employment, an increase in the quality of the queue as well as the decrease in the voluntary movement of employees to other firms. Thus the firm is able to fulfil its additional labour requirements without taking on inexperienced labour.

Now assume there is a significant expansion of demand shifting the value of π to π_2 , y to y_2, g to g_2 and h to h_2. The impact of the rise in π now is

Figure 1: The Demand for Inexperienced Labour

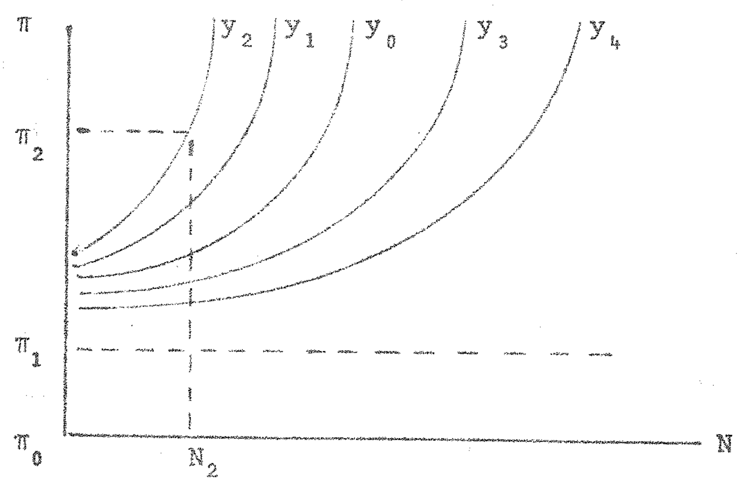


Figure 2: Wage Policy

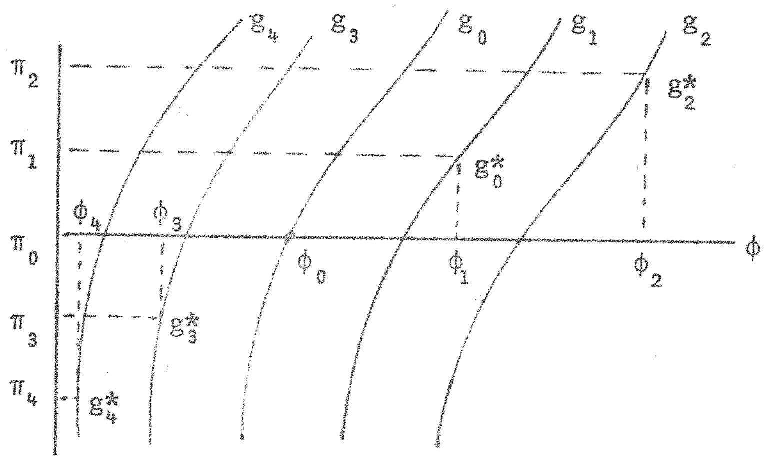
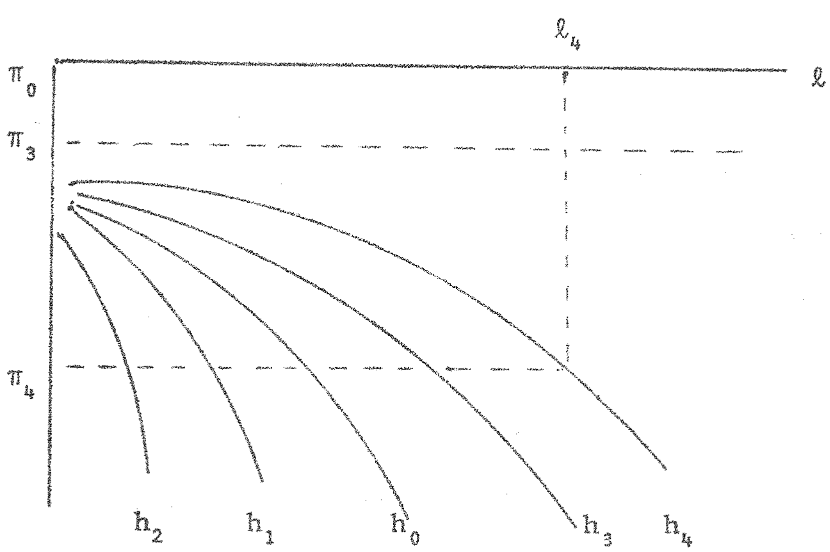


Figure 3: Layoffs



to generate a demand for inexperienced labour. The resultant rise in γ, to a certain extent, moderates this demand by shifting the curve y upward to the left and the curve g downward to the right. The outcome is that the firm will simultaneously take on N_2 inexperienced accessions and increase the proportional wage premium to ϕ_2 thereby, at the same time increasing the positive net flow of experienced labour to the firm.

As the labour market tightens, however, other firms may react in a similar manner, thus rendering wage policy less effective as an adjustment mechanism. Such a situation would be represented by a leftward shift in the curve g_2 towards g_0 and an accompanying downward shift of the y_2 to the right, that is towards y_0. In other words, it is possible that in a tight labour market, the optimally behaving firm may rely less on wage policy and more on recruiting inexperienced accessions to supplement its workforce.[26] However, this state of affairs cannot continue indefinitely as it would result in a continual decline in aggregate labour efficiency and consequently a corresponding rise in the value of γ which would ultimately tend to shift the curves back towards g_2 and y_2. Eventually the firm must reach a state where it will reduce its intake of inexperienced accessions and again use wage policy as an instrument to increase the efficiency of its workforce. Thus the characteristic cycle for the firm during a boom may be short periods of wage increases; followed by periods of inactivity in so far as the money-wage is concerned but with an increased intake of school-leavers; followed by more intensive wage competition and less school-leaver recruitment; and so the cycle repeats. The reaction of the firm at any point in time will depend upon its current state with respect to wage levels, its expectations concerning the reactions and current behaviour of other firms as well as its expectations regarding the intensity and duration of the improvement in the product market.

We now assume that the firm, starting from the same initial conditions (π_0, y_0, g_0, h_0), experiences a slight contraction in product demand such that

π decreases to π_3, y shifts down to y_3, g shifts leftward to g_3 and h shifts upwards to the right to h_3. On the assumption of a slight contraction of demand, then it follows that $0 > \pi > h$, $y > \pi$ and $g^* = \pi$ reflects the equilibrium conditions. In other words, the marginal costs of laying off employees exceeds the benefits of reducing the size of the firm's workforce. Accordingly the optimal behaviour for the firm, in terms of figure 2, is to decrease its proportional wage premium from ϕ_0 to ϕ_3 and then to allow natural wastage to take its course. In other words, by contracting the margin for experience, the firm increases the net outflow of experienced labour from the firm and as well decreases the number and quality of its queue of willing applicants.

From (15), it follows that the optimal wage offer under these circumstances will still exceed the value of the marginal product of labour so that by definition the firm is engaged in labour hoarding. Hoarding under these conditions represents optimal behaviour on the part of the firm since it seeks to preserve its reputation as a secure employer and hence to avoid the additional wage costs which would result from the loss of that reputation.

In the event of a significant contraction of product demand characterised by the condition $\pi_4 < h_4$ in figure 3, the firm will be induced to layoff employees and also to reduce its wage premium to ϕ_4 as illustrated in figure 2. The latter is designed to stimulate a net voluntary outflow of experienced labour from the firm simultaneously with the involuntary layoffs. Thus, ceteris paribus, the firm responds to a significant decline in demand by simultaneously laying off labour and reducing the wage premium. All else being equal, therefore, a recession would tend to be characterised by both voluntary and involuntary labour turnover, or voluntary and involuntary unemployment.

An explicit assumption of this model is that individuals voluntarily quit their present employment only if they have reasonable prospects of alternative more remunerative employment. Secondly, it is suggested that employers will tend to have a preference for the more experienced applicant. Accordingly voluntary quits would tend to comprise the relatively experienced whereas layoffs would tend to be the relatively inexperienced, in which case the latter would, at least according to the assumptions outlined in this model, tend to comprise the bulk of the residual unemployed during a recession.[27]

Since $\pi < 0$, it follows from (15) that the optimal wage offered by the firm will tend to exceed the value of the marginal product of labour. In other words, even though the firm is forced to layoff some labour it will still attempt to minimise the adverse impact of layoffs by maintaining a residual workforce in excess of its immediate requirements. The actual number of layoffs and the decline in the wage premium depends to a large extent on the firm's perception of the current value of a variation in aggregate labour efficiency γ. The latter depends on the firm's expectations concerning the value of experience in the future, the state of the product market, the cost of maintaining an experienced or skilled workforce as well as variations in the nominal interest rate. For a given value of π, an increase in the value of γ will tend to shift the curves g and h downwards thereby reducing both layoffs and voluntary quits. In other words, the size of the firm's workforce during a recession will depend on its perception of the future economic environment and the value attached to a relatively efficient experienced workforce as compared to that attached to operating in the future with a residual workforce composed mainly of inexperienced accessions.[28]

The adjustment process outlined above, though based on somewhat different assumptions, does share common perceptions of the labour market with conventional neoclassical, human capital and job-search theory. For instance the fact that the firm recruits inexperienced labour implies that the value of the marginal product of labour exceeds the wage rate. Similarly the fact that the firm is laying off labour implies that the wage rate exceeds the value of the marginal product of labour. The major point of departure of the present model is the demonstration that wages are not necessarily market clearing and consequently that layoffs and hoarding are a logical outcome in a labour market where labour is heterogeneous in terms of workforce experience.

IV Concluding Remarks

The present paper outlines a model of wage and employment dynamics in an attempt to explain the micro-foundations of layoffs and labour hoarding. One of the major assumptions of the analysis is that individuals improve their productive efficiency by learning by doing. Thus for the firm, the rate of accumulation of human capital is a function of its ability to attract and retain experienced labour.

It is the objective of the firm to maximise net worth and it does so, given its expectations regarding the future economic environment, by manipulating three variables: wages, layoffs and inexperienced accessions. Given this analytical framework, it is demonstrated that labour hoarding is a necessary outcome when the firm experiences a slight contraction in product demand. Likewise the dual response of both laying off and hoarding labour is shown to be a manifestation of a firm behaving optimally when confronted with a significant decline in product demand.

In terms of this theoretical framework it is an analytical result that wages are not necessarily market clearing and are relatively inflexible downwards. A unique implication of the model is that unemployment may be both voluntary and involuntary in the same period.[29] In other words, the optimally behaving firm may utilise both wage policy and layoffs in adjusting to a prospective contraction in product demand. Moreover, the extent to which the firm uses either or both instruments will depend upon the valuation it places on aggregate labour efficiency and on its reputation as a secure employer of labour.[30]

Although the notions of firm-specific human capital and search unemployment play no role in the present analysis, it is shown that many analytical outcomes of human capital and job search theory can be derived as special cases. For example, our analysis suggests that firms taking on inexperienced labour will offer a wage below the value of the marginal product of labour. Such a result might be interpreted as reflecting the self-investment hypothesis of Becker (1975). However, within the present framework, individual human capital accumulation is essentially an unavoidable byproduct of the production process and consequently does not constitute investment in the traditional sense. Similarly the wage-quit strategy; which is the central outcome of the job search models of Salop (1973), Mortensen (1970) and others; is derived in the absence of any assumption regarding the existence of search-unemployment.

The major objective of this paper has been to provide an explanation of layoffs and labour hoarding in the labour market. A subsidiary objective has been to demonstrate the futility of the notions of firm-specific human capital and search unemployment. The resulting analysis is based on the thesis that a non-degenerate distribution of wage offers is a logical outcome in a labour market where labour is differentiated in terms of workforce experience. The consequence of this thesis is that layoffs and labour-hoarding represent manifestations of firms behaving optimally within a given economic environment.

FOOTNOTES

1. Douglas (1957, p.70) suggests: "one of the most remarkable features about the theoretical work of both classical and neoclassical schools has been their failure to recognise the possibility of unemployment". This is not to say these economists were unaware of the role of turnover in the labour market. Certainly many of the issues currently attributed to the so-called 'Human Capital revolution' are explicitly canvassed in the writings of Adam Smith (1930) and Alfred Marshall (1947).

2. Pigou (1933, p.258) defines the notion of a market clearing wage as: ".... the arrangement under which real rates of wage (for men of given quality) are uniform for all centres of employment", so that "with a given system of demand functions there is only one rate of wage, which, when established everywhere, can induce nil unemployment and nil unfilled vacancies".

3. The specific human capital hypothesis was initially developed by Becker (1975) and Oi (1962). Empirical tests of the hypothesis by Oi (1962) and Mincer (1962) yielded somewhat ambiguous results. Parsons (1972) and Telser (1971) have subsequently claimed to clear up the ambiguity implicit in the earlier empirical results.

4. Doeringer and Piore (1963) show that the notion of firm-specific human capital implies the existence of internal and external labour markets. Gintis (1976, p.43) suggests that the nature of capitalism is such that:"a well articulated 'internal labor market' will develop alongside the traditional labor market, differing qualitatively from market exchange".

5. Becker (1975, p.33) suggests:"there is an incentive, therefore, not to lay off workers with specific training when their marginal product is only temporarily below wages, and the larger a firm's investment the greater the incentive not to lay them off". Okun (1973, p.208) similarly notes:"mindful of hiring, training and recruitment costs, employers hold on to some workers not needed to meet current production schedules".

6. As Becker (1975, p.33) points out: "a worker collecting some of the return from specific training would have less incentive to find a new job when temporarily laid off than others would: he does not want to lose his investment".

7. Thus Hall (1970, p.389) explains: "in the course of providing a firm logical foundation for the traditional notion of frictional unemployment, the search theory seems to claim that all unemployment is frictional, that every person who reports himself as out of work is spending a few weeks between jobs in the normal advancement of his career". Solow (1980, p.7) comments: "it is astonishing that believers have made essentially no effort to verify this central hypothesis. I know of no convincing evidence in its favour, and I am not sure why it has any claim to be taken seriously. It is hardly plausible on its face".

8. This outcome is strictly incompatable with conventional neoclassical and human capital theory. The existence of a non-degenerate distribution of wage offers in the external labour market provides the incentive for job search. In neoclassical and human capital theory, alternative wage

offers are necessarily equal to or less than the wages received by employees so that there is no incentive for job search.

9. It is a logical consequence of the search models of Mortensen (1970) and Salop (1973) that, ceteris paribus, the optimally behaving firm will always trim its workforce by reducing wages. Accordingly, there is no role for layoffs in these models. Search theorists, therefore, argue that the existence of institutional constraints within the labour market, force firms to adopt layoff policies or, like Alchian (1970), suggest that layoffs are disguised quits. Solow (1980) rejects this latter explanation when he states: "I believe that what looks like involuntary unemployment is involuntary unemployment".

10. Mincer (1962) stresses the importance of: "learning from experience" as an integral part of the on-the-job training process. Mincer (1974, p.64) however emphasises that 'productivity augmenting work experience' is an 'investment phenomenon'. In the present model 'learning by doing' is seen as an unavoidable byproduct of the production process. In other words, firms cannot choose to with-hold this training from their employees and equally employees cannot avoid benefiting from the productivity augmenting effects of experience. As Blang (1974, p.837) points out: "it is difficult to see how individuals can choose more or less learning-by-doing, although no doubt business firms will want to minimize the number of inexperienced workers, everything else being the same". Thurow (1976, p.79) stresses: "only actual production generates the degree of realism necessary to polish production skills".

11. Becker (1975), Weiss and Lillard (1978) attribute the decline in cross-sectional age-earnings profiles towards the end of working life as mainly due to vintage effects. As Becker demonstrates this does not necessarily imply a similar decline in time-series or longitudinal age-earnings profiles. Mincer (1974, p.22) suggests: "the depreciation rate on human capital is likely to be related to age, experience, and size and vintage of stock".

12. Hall (1974, p.356) points out: "a satisfactory theory should encompass waiting - for an old, or a better, new job - as well as searching". Thus: "job seekers are all individuals interested in new work whether employed or not" (p.355).

13. In other words, inexperienced labour 'learns under supervision' while experienced labour 'learns by doing'.

14. Feldstein (1976, p.938) suggests: "in a competitive labour market, employers will have to offer the economically feasible combination of unemployment, wages and conditions that workers prefer". Baily (1977, p.1045) points out: "such firms, that offer unstable employment, will have to bear the cost of this in the form of a higher wage paid to compensate for instability".

15. In terms of the human capital framework of Becker (1975), ϕ would be interpreted as the employee's share of the productivity augmenting benefits (evaluated at the margin) of on-the-job training. Likewise in the present analytical framework ϕ represents the employee's share in the benefits of workforce experience. In proportional terms, ϕ is equivalent to the 'wage markup' over the unskilled (inexperienced or entry) wage in Hamermesh and Goldfarb (1970).

16. Gintis (1976, p.51) points out: "the endogeneity of the wage bill is a real and concrete contingency of profit maximisation". In a similar vein, Ross and Wachter (1973, p.677) suggest: "for a long-term wage contract to have operational significance, it is necessary that the contract include a wage premium that will insulate the firm from short-run changes in the economy-wide demand for labour". It is immaterial whether employers contract on an individual basis as in Jovanovic (1979) or offer a set of multiple wage-job contracts (a wage structure) as in Miyazaki (1977).

17. In so far as the individual firm is concerned, the function Q is regarded as given, that is determined by the wage policies of other firms.

18. Weiss (1980, p.527) thus suggests: "the wage offered by a firm affects not only the number of job applicants to the firm but also the expected labour endowment of workers hired by the firm", and equally: "if the firm cut its wages, its best workers would quit". Hamermesh (1969, p.128) reinforces this conclusion when he observes that: "highly skilled workers will be more likely to find alternative employment since they are generally more acceptable workers".

19. This constraint allows for the possibility of disequilibrium in the product market. See Barro and Grossman (1971).

20. For $t > 0$ each parameter is an expectational variable. Hence it is implicitly assumed that firms have static expectations regarding the future.

21. Salop (1973), for instance, derives this condition on the explicit assumption that labour is homogeneous in production.

22. The firm is, in effect, faced with a three dimensional adjustment problem. It must minimise the adverse effects of wage cuts, layoffs and hoarding. Thus Weiss (1980, p.527) suggests: "to avoid adverse selection ramifications of a wage cut, firms may instead arbitrarily lay off workers". Hamermesh (1969, p.110) points out: "hoarding may be the profit maximising response to the costs of decreasing employment". Okun (1973, p.212) observes:"... in periods of recession or slack, the amount of labour kept on the payroll is greater than the amount technologically required to produce the prevailing depressed level of output".

23. A similar analytical outcome is suggested by Hamermesh (1969).

24. This condition implies a strategy similar to the wage-quit strategy identified in Salop (1973) and Pencavel (1972).

25. This analytical outcome might be compared to that of 'implicit contract' or 'risk-shifting' theory. In these models, as Grossman (1979, p.67) points out: "... a worker's nominal wage income equals either the value of his marginal product minus an implicit insurance premium or the value of his marginal product plus an implicit insurance indemnity, depending on whether the perceived real value of his marginal product is high or low". In the present model the employee evaluates the ex post performance of the firm whereas in the implicit contract models workers assess the ex ante intentions of the firm with respect to layoffs.

26. Okun (1973, p.209) observes that: "skill differentials and industrial wage differentials tend to narrow - not widen - in a high pressure economy".

27. Employees are unlikely to quit in a significant recession unless they have reasonable prospects for alternative employment.

28. Solow (1980, p.8) points out: "... if employers know that aggressive wage cutting in a buyer's market may antagonise the remaining workforce, hurt current productivity, and make it harder to recruit high quality workers when the labour market tightens, they will be less inclined to push their short-run advantage".

29. The optimally behaving firm that is laying off labour may still revise its wage offer downwards though not nearly to the extent of the neoclassical and job-search models.

30. Once any adjustment to its workforce is accomplished, the firm still has to replace retirements and dismissals and consequently must be mindful of its reputation regardless of the anticipated contraction in demand.

REFERENCES

Alchian, A.A. (1970). "Information Costs, Pricing, and Resource Unemployment", in Microeconomic Foundations of Employment and Inflation Theory (edited by E.S. Phelps, et al), New York, W.W. Norton and Co Inc, pp.27-52.

Baily, M.N. (1977). "On the Theory of Layoffs and Unemployment", Econometrica, July, pp. 1043-1063.

Barro, R.J. and H.I. Grossman (1971). "A General Disequilibrium Model of Income and Employment", American Economic Review, March, pp.82-93.

Becker, G.S. (1975). Human Capital, New York and London, Columbia University Press.

Blang, M. (1976). "The Empirical Status of Human Capital Theory: A Slightly Jaundiced Survey", Journal of Economic Literature, September, pp.827-855.

Doeringer, P.B. and M.J. Piore (1971). Internal Labour Markets and Manpower Analysis, Lexington, Massachusetts, D.C. Heath and Company.

Douglas, P.H. (1957). The Theory of Wages, New York, Sentry Press.

Feldstein, M. (1976). "Temporary Layoffs in the Theory of Unemployment", Journal of Political Economy, October, pp.937-956.

Gintis, H. (1976). "The Nature of Labor Exchange and the Theory of Capitalist Production", Review of Radical Political Economy, Vol.8, No.2, pp.36-54.

Grossman, H.I. (1979). "Why Does Aggregate Employment Fluctuate?" American Economic Review, May, pp.64-69.

Hall, R.E. (1970). "Why is the Unemployment Rate So High at Full Employment?" Brookings Papers on Economic Activity, 3, pp.369-410.

Hall, R.E. (1974). "The Process of Inflation in the Labor Market", Brookings Papers on Economic Activity, 2, pp.343-393.

Hamermesh, D.S. (1969). "A Disaggregative Econometric Model of Gross Changes in Employment", Yale Economic Essays, Fall, pp.107-146.

Hamermesh, D.S. and R.S. Goldfarb (1970), "Manpower Programs in a Local Labor Market: A Theoretical Note", American Economic Review, September, pp.706-709.

Jovanovic, B. (1979). "Job Matching and the Theory of Turnover", Journal of Political Economy, October, pp.972-990.

Mackie, P. (1976). The Chairman: A Play, London, Samuel French.

Marshall, A. (1947). Principles of Economics, Eigth edition, London, Macmillan and Co, Ltd.

Mincer, J. (1962). "On-the-job Training: Costs, Returns and Some Implications", Journal of Political Economy, Supplement, October, pp.50-79.

Mincer, J. (1974). Schooling, Experience, and Earnings, New York, National Bureau of Economic Research, Columbia University Press.

Miyazaki H. (1977). "The Rat Race and Internal Labor Markets", Bell Journal of Economics, Vol.8, No.2, pp.394-418.

Mortensen, D.T. (1970). "A Theory of Wage and Employment Dynamics", in Microeconomic Foundations of Employment and Inflation Theory (edited by E.S. Phelps et al), New York, W.W. Norton and Co, Inc, pp.167-211.

Oi, W.Y. (1962). "Labour as a Quasi-Fixed Factor", Journal of Political Economy, November/December, pp.1120-1143.

Okun, A.M. (1973). "Upward Mobility in a High-pressure Economy", Brookings Papers on Economic Activity, 1, pp.207-252.

Parsons, D.O. (1972). "Specific Human Capital: An Application to Quit Rates and Layoff Rates", Journal of Political Economy, November/December, pp.1120-1143.

Pencavel, J.H. (1972). "Wages, Specific Training, and Labour Turnover in U.S. Manufacturing Industries", International Economic Review, February, pp.53-63.

Pigou, A.C. (1933). The Theory of Unemployment, London, Macmillan and Co Ltd.

Ross, S.A. and M.L. Wachter (1973). "Wage Determination, Inflation, and the Industrial Structure", American Economic Review, September, pp.675-692.

Salop, S.C. (1973). "Wage Differentials in a Dynamic Theory of the Firm", Journal of Economic Theory, 6, pp.321-344.

Smith, A. (1930). A Inquiry into the Nature and Causes of the Wealth of Nations, Vol.1, Fifth edition, London, Methuen and Co Ltd.

Solow, R.M. (1980). "On Theories of Unemployment", American Economic Review, March, pp.1-11.

Telser, L.G. (1971). Competition, Collusion and Game Theory, Aldine, Macmillan.

Thurow, L.C. (1976). Generating Inequality, London, Macmillan.

Weiss, A. (1980). "Job Queues and Layoffs in Labor Markets with Flexible Wages", Journal of Political Economy, June, pp.526-538.

Weiss, Y and L.A. Lillard (1978). "Experience, Vintage, and Time Effects in the Growth of Earnings: American Scientists, 1960-1970", Journal of Political Economy, June, pp.427-447.

WORKING PAPERS IN ECONOMICS

* 1	I.G. Sharpe	A Framework for Analysis of the Money Supply Process in Australia
* 2	I.G. Sharpe & R.G. Walker	Asset Revaluation and Stock Market Prices
* 3	N.V. Lam	Incidence and Stabilization Impact of Tin Export Taxation in West Malaysia
* 4	V.B. Hall & M.L. King	Inflationary Expectations in New Zealand: A Preliminary Study
* 5	A.J. Phipps	Strike Activity and Inflation in Australia
6	N.V. Lam	Incidence of the Rice Export Premium in Thailand
* 7	I.G. Sharpe	Secondary Reserve Requirements, the Monetary Base and the Money Supply in Australia
8	P. Saunders	Labour Demand Functions and the Quasi-Fixity Hypothesis: Some Empirical Results for U.K. Manufacturing Industries, 1963-1974
9	W.P. Hogan	Economic Strategies for Recovery
10	T.P. Truong	Asset Revaluation and Share Prices: A Study using the M.S.A.E. Regression Technique
11	S. Kim	Instability of Primary Exports, Income Stabilization Policies and Welfare
*12	I.G. Sharpe & P.A. Volker	Institutional Change, Specification Error, Inflation and the Stability of the Demand for Money Function in the United States, 1901-1974
*13	I.G. Sharpe & P.A. Volker	The Impact of Institutional Changes on the Australian Short-Run Money Demand Function
*14	W.P. Hogan	The Connections Between Foreign Trade and Economic Development: An Empirical Study
*15	F. Gill	The Case of the Black Exodus from the Southern U.S., 1910-1970: Some Lessons for Theory and Applied Theory
*16	A.J. Phipps	The Impact of Wage Indexation on Wage Inflation and Strike Activity in Australia
*17	V.B. Hall	Pricing Behaviour in Australia: A Data Evaluation Study
*18	I.G. Sharpe	Australian Money Supply Analysis: Direct Controls and the Relationship Between the Monetary Base, Secondary Reserve and the Money Supply
*19	L. Haddad	Economic Systems: Towards a New Classification
20	G. Lewis	A Strategy for Winning at Roulette

21	R.L. Brown	A Test of the Black and Scholes Model of Option Valuation in Australia
*22	V.B. Hall	Pricing Behaviour in Australian Manufacturing Industry: Hypothesis Testing 1955-1956 to 1967-1968
*23	I.G. Sharpe & P.A Volker	The Selection of Monetary Policy Instruments: Evidence from Reduced Form Estimates of the Demand and Supply of Money in Australia
*24	V.B. Hall	Excess Demand and Expectations Influences on Price Changes in Australian Manufacturing Industry
*25	I.G. Sharpe & P.A. Volker	The Tradeoff Between Improved Monetary Control and Market Interest Rate Variability in Australia: An Application of Optimal Control Techniques
*26	Evan Jones with the assistance of Mary MacDonald	An Examination of Earnings Differentials in Australian Manufacturing Industry
27	W.P. Hogan	Questions on Structural Adjustment Policies
28	P. Saunders	Price and Cost Expectations in Australian Manufacturing Firms
29	W.P. Hogan, I.G. Sharpe & P.A. Volker	Regulation, Risk and the Pricing of Australian Bank Shares 1957-1976
30	W.P. Hogan	Quicksands of Policy-Making
31	C. Emerson	Taxing Natural Resources Projects
32	R.W. Bailey, V.B. Hall & P.C.B. Phillips	A Small Model of Output, Employment, Capital Formation and Inflation, applied to the New Zealand Economy
33	W.P. Hogan	Eurofinancing: Currencies, Loans and Bonds
34	S. Adei	The Growth of Foreign Investment and Economic Nationalism in Post Independence Ghana: 1957-1975
35	W.P. Hogan	The 40 Per Cent Investment Allowance
36	W.P. Hogan	Controlling Eurofinance Markets
37	R.T. Ross	Disaggregate Labour Supply Functions for Married Women: Preliminary Estimates for New Zealand
38	U.R. Kohli	Beginning- and End-of-Period Specifications of Asset Market Equilibrium in Balance-of-Payments

39	G. Mills	Government Incentive Contracts with Private Companies: Some Lessons from the Channel Tunnel
40	C.G.F. Simkin	Closer Economic Relations Between Australia and New Zealand
41	U.R. Kohli	Relative Price Effects and the Demand for Imports
42	W.J. Merrilees	Alternative Models of Apprentice Recruitment: with Special Reference to the British Engineering Industry
43	P. Saunders	Price Determination in Australian Manufacturing Firms: A Cross-Section Study
44	W.P. Hogan	Immigration Policies and Issues
45	W.J. Merrilees	Labour Market Segmentation in Canada: A Translog Approach
46	W.J. Merrilees	Pricing Strategies in the Newspaper Industry
47	J.L. Whiteman	The Micro-Foundations of Layoffs and Labour-Hoarding

Papers marked with an asterisk are out of stock. Copies of the others are available upon request from:

Department of Economics
The University of Sydney
N.S.W. 2006

Working Papers in Economics that have been accepted for publication elsewhere

2	I.G. Sharpe & R. G. Walker	Journal of Accounting Research, Fall, 1975, 293-310.
3	N. V. Lam	Journal of the Developing Economies Vol. 17, No. 1, March 1979.
4	V. B. Hall & M. L. King	New Zealand Economic Papers, 1976, 118-51.
5	A. J. Phipps	Economic Record, September 1977, 297-319.
6	N. V. Lam	Journal of Development Studies Vol. 14, No. 1, October 1977.
7	I.G. Sharpe	Australian Journal of Management, April 1976, 85-106.
9	W. P. Hogan	Economic Papers, No. 55, The Economic Society of Australia and New Zealand, 29-57.
13	I. G. Sharpe & P. A. Volker	Kredit und Kapital, Vol. 12, No. 1, 1979
14	W. P. Hogan	Some Calculations in Stability and Inflation, A.R. Bergstrom et.al. (eds.), John Wiley and Sons, 1978.
21	R. L. Brown	Australian Journal of Management, Vol. 3, No. 1, April 1978, 17-36.
23	I.G. Sharpe & P. A. Volker	The Australian Monetary System in the 1970s, M. Porter (ed.), Supplement to the Economic Record, 1978.
24	V. B. Hall	Economic Record, Vol. 56, No. 152,
27	W. P. Hogan	"Divising Structural Adjustment Policies, Malayan Economic Review, Vol. 24, No. 1., pp. 69-81.
30	W. P. Hogan	Australian Economic Papers, Vol. 18, No. 33, December 1979.