ON THE THEORY OF LAYOFFS AND UNEMPLOYMENT

BY MARTIN NEIL BAILY

This paper develops a theory of the firm's demand for labor when workers, at the time they are hired, know that they may later be laid off. The derived behavior shows how the firm, in response to price falls of increasing severity, will first reduce hours of work. After a minimum work week has been reached layoffs start. The point at which this occurs depends upon the income workers expect to receive if they are laid off. Since unemployment insurance (UI) benefits are an important determinant of this income level, they influence the number of layoffs. Given the absence of an effective incentive tax in practice, we would predict that the present UI system encourages layoffs. An effective incentive tax could stop this encouragement.

Two possible wage strategies are explored, both of which are consistent with the basic layoff and hours model. The flexible wage policy has the advantage of giving no incentive to the firm to default on the (privately) efficient layoff rules derived earlier, but seems to be inconsistent with observed short-run wage policy. The fixed wage policy has its strength and weakness the other way around.

1. INTRODUCTION

A CONSISTENT FEATURE OF RECENT ATTEMPTS to put macroeconomic analysis on a firmer microanalytic base is the assumption that economic agents look ahead to tomorrow when they make today's decisions. Of course, it has long been realized that the owner of a durable asset has an interest in tomorrow's price of the asset. However, a competitive firm that can rent factor services in a spot market every period will set the quantity of these services it purchases based purely upon the current product price and the rental or wage rate. The inadequacy of this theory to explain observed facts led to the introduction of adjustment costs into the theory of investment, for example by Gould [14], and into the theory of labor demand by Oi [20] and others. A firm subject to adjustment costs must look ahead and predict demand tomorrow when setting its factor demand today.

The development of search theory illustrated the fact that both consumers and workers also have a kind of adjustment cost. A worker who leaves a firm or a client who changes his barber or his stockbroker must both find out about the alternatives open to them. This involves a cost in either case, especially for the worker who spends time unemployed. Firms realize that mobility is costly for customers and workers and will take this into account when they set their wage or price. This was explored in influential papers by Phelps and Winter [23] and Mortensen [18]. The importance of lack of information per se has perhaps been exaggerated, but the importance of mobility costs at least for workers is clear. Having been laid off, a worker cannot go immediately to a comparable job. Given the stochastic pattern of labor demand he may simply have to wait out a spell of unemployment before...
an acceptable job opens up. In many cases workers simply wait to be recalled to their old jobs, or end up at their old jobs even after searching for alternatives. This imposes loss of income and possibly search costs on the worker, costs that would be higher were it not for unemployment insurance (UI) benefits. This paper presents a theory of the firm in which the firm is faced with adjustment costs, but more importantly where workers, at the time they join the firm, realize that they may be laid off in the future.

This is not the first time such an assumption has been used. In Azariadis [2], D. Gordon [11], Grossman [15], Okun [21] and in my own work (Baily [3]), the implications of long-term labor attachment are examined while R. Gordon [13] considers the implications of the approach for the theory of inflation and unemployment. The emphasis of this paper is very different, however. In the Azariadis–Gordon–Baily approach, a principal feature is that workers are risk averse while firms are not. Firms will therefore offer an implicit contract to workers that reduces risk. In this paper I am not concerned with issues of risk. Both firms and workers are risk neutral and what gives both their concern with the future is the presence of adjustment costs for the firm or the cost of a layoff for the worker. In addition, two extra degrees of freedom are added to earlier work of this type (i) by allowing the firm to vary hours worked per worker, and (ii) by allowing a worker to look for an alternative job if laid off. In the search theory approach to unemployment it is usually assumed that the only kind of layoff is a permanent layoff while in the implicit contract models it is assumed that the only layoffs are temporary layoffs—or at least mobility is not discussed. In this model there can be either kind. The focus on the labor market is retained since the firm is a price-taker and has a fixed capital stock.

Much of the paper is concerned with the working out of the properties of the model. The behavior of employment, hours of work, and the wage are derived in response to falls in demand of different degrees of severity. The derived behavior looks not unlike the way we think actual firms behave. The approach chosen shows how the cost to the worker of a layoff actually influences the number of layoffs the firm makes. Given the workers look ahead, the firm is able to reduce its wage offer by reducing the layoff probability. Obviously, there is a trade-off for the firm because fewer layoffs means a lower marginal product, but the profit-maximizing solution depends upon the amount of a worker's income if he is laid off. One important determinant of this income is the amount of unemployment insurance benefits. Thus the level of these benefits actually influences the number of layoffs. This question, an important one for policy purposes, is examined in detail.

2. A FIRM THAT HIRES AND LAYS OFF

This model considers a firm that carries with it a reputation about its past layoffs. When workers consider joining the firm they look at the expected wage-employment package being offered. They do not know the extent of the future decline in demand (which will be a fall in the price) and, hence, the actual
number of layoffs. They are, however, assumed to have an expectation about the layoff policy of the firm. The layoff policy is a rule that determines how the level of employment will change when demand declines (the price falls). This assumption is appropriate where firms have a history of hiring and firing: a pattern or reputation for the firm is established. It is a case of considerable importance. A large fraction of total layoffs comes from firms that have seasonal fluctuations and/or frequent cyclical fluctuations in demand.\(^2\) 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 the instability.

The model will consider two periods only. The assumptions are as follows:

**Assumption 1:** The firm is a price-taker in both periods. In Period zero the price \(P_0\) is known and the firm is hiring workers. The initial average hourly wage offer \(W_0\), the initial employment \(L_0\), and hours of work \(H_0\) are set by the firm.

**Assumption 2:** The price in Period one, \(P_1\), is not known in period zero. It is a random variable. But to focus on the impact of demand falls it is assumed that \(0 < P_1 < P_0\). Employment \(L_1\), the wage \(W_1\), and hours \(H_1\) in Period one are chosen once \(P_1\) is known and are again decision variables of the firm. To focus on the layoff decision and because of the artificiality of the two-period context, it is convenient to impose as a constraint the condition \(L_1 \leq L_0\). This is quite natural given the assumption on price and within a many-period model it could be derived rather than assumed.\(^3\) \(L_1\), therefore, is chosen by the firm subject to \(L_1 \leq L_0\).

**Assumption 3:** The workers evaluate the expected two-period income offer the firm is making. This is given by:

\[
W_0 H_0 - D(H_0) + E\left[ \frac{L_1 (W_1 - D(H_1))}{L_0} + \frac{(L_0 - L_1)}{L_0} Y \right] \rho = V.
\]

The terms \(D(H_0)\) and \(D(H_1)\) are the disutility of work in the two periods. It is assumed that:

\[
D(H) > 0, \quad D'(H) > 0, \quad D''(H) > 0 \quad \text{for} \quad H > 0.
\]

The disutility of work is the difference between the utility level of no work and the utility of working \(H\) hours for the same income (with a scaling to put it in income-equivalent units).\(^4\) The first inequality says persons would not be willing to pay a positive price for the privilege of working. The inequalities on \(D'\) and \(D''\) correspond to positive decreasing marginal utility of leisure. A condition that is

\(^2\) Fair [8] emphasizes the importance of short-run month-to-month employment variations.

\(^3\) Other finite period models have similar problems, e.g., optimal growth models where the final capital stock often has to be constrained.

\(^4\) The fact that workers consider expected income implies risk neutrality with respect to income. Including the disutility of work in this form implies an additively separable utility function linear in income, concave in leisure.
stronger than necessary, but useful to show a solution exists is:

\[(3) \quad D'(H)H - D(H) \to \infty \quad \text{as} \quad H \to H_{\text{max}}\]

where \(H_{\text{max}}\) is presumably less than or equal to 24 hours per day. The condition says marginal disutility increases faster than average disutility. A utility function logarithmic in leisure satisfies (3). The first term in the parentheses gives the probability of remaining employed in Period one times the income, less disutility of work. The second term is the probability of a layoff times \(Y\), the value of a worker's income if he is laid off.\(^5\)

In what follows the firm will take equation (1) as a constraint with \(V\) fixed. This corresponds to the assumption of a competitive firm that is small relative to the size of the labor market. It can hire as many workers as it wishes provided it makes a good enough wage-employment offer. Taking \(V\) as fixed is also important because the problem is then to maximize profits subject to a given level of worker expected income. This is the same as the problem of maximizing expected worker income for a given profit, and the solution to both is efficient for the firm and workers together (not necessarily socially efficient). The actual value of \(V\) depends upon the prevailing labor market conditions; \(\rho\) is the discount factor.

Consider what constitutes a worker's income \(Y\) if he is laid off. A worker will generally be eligible to receive UI benefits. Let \(B\) be the level of these benefits as a flow per period and let \(\delta\) be the duration of unemployment as a fraction of the period. The amount received in benefits is then \(\delta B\). It is important to note that benefit income is not subject to tax, whereas wage income is. In empirical analyses it is usual to look at the relationship between the benefit level and take-home pay. In the context of this firm decision-making model it is better to think of \(B\) as the dollar UI benefit scaled up to make it comparable to taxable wage income.\(^6\)

There is a very considerable literature concerned with the theory and importance of search and lack of information as factors in unemployment and labor mobility (see, for example, [1, 17, and 22] and references therein). There has recently been something of a shift away from this view on the grounds (i) that unemployment seems too persistent to be explainable by misinformation about the state of the labor market, and (ii) that workers do not seem to spend a large fraction of their time while unemployed searching for new jobs (see, for example, [12]). Nevertheless, it is certainly true that some fraction of workers who are laid off do find new jobs. The alternatives are (i) a worker may not look for a new job at all but simply remain unemployed for all of Period one, (ii) a worker may look for a new job but fail to find one that offers an acceptable wage income, (iii) a worker may look for and accept a new job. Clearly the two-period analysis is doing some violence to reality, but it seems reasonable to think of the first two alternatives as showing up in the data as temporary layoffs. The workers fail to look for or to

\(^5\) \(Y\) may also include a term for the disutility of work at a new job. See below for a detailed discussion of \(Y\).

\(^6\) This is too simple because progressive income taxes would change the scaling factor depending on wage income. Taxes are not very progressive in the relevant range.
accept new jobs expecting to return to their old jobs in future time periods. The
first case is, of course, a permanent layoff or job change.

It is certainly true that the intensity of the search effort is important in
determining the duration of unemployment \( \delta \). Let \( C \) measure both the intensity of
search and its costs measured in income units. It is also possible to include in \( C \)
mobility costs involved in job changing. A new job may mean a new location or
many other possible expenses or disutilities.\(^7\) The value of an alternative job
(expected wage income less disutility of work) that the worker is willing to accept
is the other decision parameter that influences the duration of unemployment, so
let \( A \) measure this acceptance value.

A very much simplified version of the process of job mobility will be assumed.
Specifically, \( Y \) will be assumed nonstochastic. This is restrictive but perhaps less
so than it seems because workers are risk neutral; \( Y \) can be thought of as an
expected value. A worker who is laid off sets his search intensity \( C \) and acceptance
level \( A \). \( Y \) is then given by:

(4) \[ Y = (B - C)\delta + A(1 - \delta) \]

where duration \( \delta \) is given by:

(5) \[ \delta = \delta(C, A), \quad \frac{\partial \delta}{\partial C} \leq 0, \quad \frac{\partial \delta}{\partial A} \geq 0, \quad 0 < \delta \leq 1. \]

We would expect workers to set \( C \) and \( A \) to maximize \( Y \), and this condition will be
utilized in Section 6.

Consider also the relation between the two key parameters \( Y \) and \( V \). \( V \) is the
two-period expected income the firm must offer if it is to attract workers when it is
hiring. For a firm that keeps a "pool" or hiring hall of available workers, using all
of them at peak times and only some during demand falls, then \( V \) can be thought
of as determining the expected long-run value of the job. The workers will stay in
the firm's pool provided the long-run expected income they receive, allowing for
layoffs, matches that offered elsewhere. For such workers \( Y \) is just \( B \), the
unemployment insurance benefit. For firms that have a changing labor force, that
hire new workers when demand is high and whose workers find other jobs in
downturns, then the worker's information state is important. A worker who has
already spent time unemployed and who has acquired information about available
jobs will only be attracted to the firm when it is hiring by a job offer comparable to
other firms. This sets \( V \) for the hiring decision. A worker facing a layoff has the
prospect of waiting out a spell of unemployment and having to acquire informa-
tion about other jobs (paying \( C \)). This sets \( Y \) for the layoff decision. In addition, it
is probable that the firm, when hiring, will be facing a labor market where many
other firms are hiring whereas, when it is laying off, alternative job options for
workers are much fewer or less attractive. It will be assumed throughout that:

(6) \[ V > Y + Y_p. \]

\(^7\) The larger the mobility costs a worker is willing to pay presumably the easier it is to find a job.
Hence, \( C \) interpreted in this way still affects unemployment duration \( \delta \).
The initial expected income offer must be better than simply paying \( Y \) for the two periods.

**Assumption 4:** The firm’s objective function is its two-period expected profit given by:

\[
P_0 G(H_0L_0) - W_0H_0L_0 + E[P_1 G(H_1L_1) - W_1H_1L_1 - T(L_0 - L_1)]p.
\]

The production function, with capital assumed fixed, is well-behaved with the following properties:

\[(8a)\] \[G'(HL) > 0, \quad G''(HL) < 0 \quad \text{for all finite } H \text{ and } L.\]

\[(8b)\] \[G'(HL) \to \infty \quad \text{as } HL \to 0; \quad G'(HL) \to 0 \quad \text{as } HL \to \infty.\]

\[(8c)\] \[G'(HL)H \quad \text{is bounded above for a fixed } L > 0.\]

Condition (8a) is standard. Condition (8b) is not necessary but ensures an interior maximum. The third condition is a little more unusual. It says that if the firm has a fixed number of workers it cannot raise the per-worker marginal product indefinitely by changing hours (although it can do so by reducing \( L \) with fixed \( H > 0 \)). Since increases in \( H \) are bounded by the laws of nature, the only way of doing this would be by letting \( H \) go to zero. The condition (8c) therefore says that the hourly marginal product goes to infinity slower than \( H \) goes to zero.

\( T \) is the per-worker adjustment cost or turnover cost associated with layoffs. \( T \) reflects both the tax incentive impact of the UI program and any other turnover costs. \( T \) is assumed not to depend upon wages or hours. This represents an oversimplification, in particular of the rather bewildering incentive tax financing provisions of the UI program. It is assumed that the firm has some fixed per-worker liability for UI benefits paid to workers it lays off. In Section 6 two alternatives are considered (i) where the firm has zero liability, and (ii) where the firm is fully liable for benefits paid. It will also be assumed that \( T < Y \). It is not clear this is always satisfied and in cases where it is not firms will not make temporary layoffs. This is discussed further in Section 6.

**3. The Maximizing Conditions**

Consider first what might be called a “rational” theory of layoffs. This is where both firms and workers know the true probability distribution of the state variable \( P_1 \), and the layoff rule that will be followed. The firm then maximizes (7) subject to the constraint (1) on the value of its wage-employment offer (associate this constraint with the Lagrange multiplier \( \lambda \) ) and to the inequality assumption \( L_1 \leq L_0 \) (associate the Kuhn-Tucker multiplier \( \mu \)). Taking the derivative with respect to \( W_0 \) and equating to zero we find the value of the Lagrange multiplier:

\[
\lambda = L_0.
\]
Theory of Layoffs

The condition on $H_0$ to determine hours of work in Period zero is:

\[(10) \quad P_0 G'(H_0L_0)L_0 - W_0L_0 + \lambda [W_0 - D'(H_0)] = 0\]

which gives $P_0 G'(H_0L_0) = D'(H_0)$.

For $H_1$ we obtain the similar condition:\(^8\)

\[(11) \quad P_1 G'(H_1L_1) = D'(H_1)\]

In both cases we have the natural result that the hourly marginal product is set equal to the marginal disutility of work. When price varies, firms will vary hours of work, overtime during peaks\(^9\) and possibly short-time during slumps, but there are limits to this that are set by conditions (10) and (11). The number of layoffs is determined by setting $L_0$ and $L_1$. First the condition on $L_1$:

\[(12) \quad P_1 G'(H_1L_1)H_1 - D(H_1) = Y - T + \mu/\rho\]

where $\mu \geq 0$, $\mu [L_0 - L_1] = 0$. The left-hand side of this is the per-worker marginal product less the disutility of work. This latter term always enters because a laid-off worker will avoid the disutility of having to work at the firm he has just left.\(^10\)

The initial hiring decision is determined by:

\[(13) \quad P_0 G'(L_0H_0)H_0 - W_0H_0 = E \left[ \frac{\lambda L_1H_1W_1 - L_1D(H_1) - L_1Y}{L_0^2} \right] \rho + T \rho - \mu \]

using the earlier conditions this becomes:

\[(14) \quad P_0 G'(L_0H_0)H_0 + E \left[ \frac{L_1}{L_0} P_1 G'(L_1H_1)H_1 \right] \rho = W_0H_0 + E \left[ \frac{L_1W_1H_1}{L_0} + \left( \frac{L_0 - L_1}{L_0} \right) T \right] \rho , \]

which is a natural extension of the marginal productivity/wage condition to a firm facing a possible decline in demand. This is the economically intuitive form of the condition, but using the constraint we can substitute again to obtain the useful equivalent condition:

\[(15) \quad P_0 G'(L_0H_0)H_0 - D(H_0) + E [P_1 G'(L_1H_1)H_1 - D(H_1)] \rho = V.\]

Consider the firm’s decision process in reverse time order, starting with Period one. $L_0$ is given for the firm at that time and $P_1$ is known. Equations (11) and (12) represent the decision rules that set $L_1$ and $H_1$ given $P_1$. The known value of $L_0$ will allow us to determine whether $\mu > 0$ or $\mu = 0$. At the beginning of Period zero the distribution of $P_1$ is known and given the decision rules (11) and (12) this

\(^8\) $H_1$ and $L_1$ are set after $P_1$ is known. Equation (11) (with (12) below) will determine $H_1$ and $L_1$ for any given $P_1$.

\(^9\) See Section 5 for a discussion of this. $W$ is the average hourly wage—total wage income divided by hours worked. This may include overtime wage payments.

\(^10\) It has been argued that the odium of unemployment offsets this.
implies the distributions of $L_1$ and $H_1$ are known also. The firm can, therefore, evaluate equations (10) and (15) to determine initial employment and hours. Thus equations (10), (11), (12), and (15) will determine the firm’s choice of $H_1$, $L_1$, $H_0$, and $L_0$. These conditions are independent of $W_0$ and $W_1$ which may seem strange. The firm is not free to set arbitrary wage rates, of course. It must choose values that satisfy the constraint equation (1) given the choice of the other variables. The reason (10), (11), (12), and (15) do not depend explicitly on the $W$’s is that $Y$ and $V$ are playing the role played by the market wage rate in a more conventional theory-of-the-firm model. See also the discussion of Section 5.

4. THE NATURE OF THE SOLUTION

The formal structure of the model is not the aspect of particular interest here. It will simply be assumed that a nonzero maximum exists. It will be shown that there exists a nonzero solution to the first-order necessary conditions and that this solution is unique. This will then be the maximum. It is often convenient to substitute (11) into (12). If $\mu = 0$ this gives:

$$(16) \quad D'(H_1)H_1 - D(H_1) = Y - T.$$  

Given the assumptions on $D$ there is certainly some $H_1$ that satisfies (16) and since the left-hand side is monotonic this $H_1$ is unique. Since $Y - T > 0$ we have $H_1 > 0$. Inserting this $H_1$ into (11) shows that, since $P_1 > 0$, there is a unique $L_1 > 0$ that satisfies (11). The solution of (11) and (12) is then to take the $L_1$ and $H_1$ that satisfy (11) and (16) unless $L_1 > L_0$, in which case set $L_1 = L_0$ and $H_1$ is found from (11). For any given $P_1$ this gives unique values of $L_1 > 0$ and $H_1 > 0$ provided $L_0 > 0$. Equation (10) gives a unique $H_0 > 0$ for given $L_0 > 0$ and $P_0 > 0$. The condition that ensures that there is finally an $L_0 > 0$ that satisfies (15) is by assumption. It was assumed that $P_0$ is high enough to induce the firm to operate. The uniqueness of $L_0$ can be shown by assuming the converse. Suppose there are two solutions $L_0$ and $L_0^*$ and that $L_0^* > L_0^{**}$. First, from (11), (12), and (16) we know that (i) when $P_1$ does not imply layoffs on the single-star solution then $L_1^* = L_0^* > L_1^{**}$, (ii) when $P_1$ implies layoffs on both solutions then (11) and (16) imply $L_1^* = L_1^{**}$. Hence, $L_1^* > L_1^{**}$ for all $P_1$. Second, since $P_0$ is given, $L_0^* > L_0^{**}$ implies from (10) that $H_0^* < H_0^{**}$ and then that:

$$(17) \quad P_0 G'(L_0^*H_0^*)H_0^* - D(H_0^*) = D'(H_0^*)H_0^* - D(H_0^*)< D'(H_0^{**})H_0^{**} - D(H_0^{**}) = P_0 G'(L_0^{**}H_0^{**})H_0^{**} - D(H_0^{**}).$$

---

11. This is just a heuristic statement. Obviously the conditions are solved simultaneously.

12. A contradiction will be shown since $L_0^* > L_0^{**}$ implies from (11) and (12) that $L_1^* > L_1^{**}$ while it also implies (9) and (15) that $L_1^* < L_1^{**}$.

13. Since we would have $\mu^* = 0$, $\mu^{**} > 0$ we know from (11) and (12) that $H_1^* < H_1^{**}$ and so $L_1^* > L_1^{**}$.
This then implies from (15) that:

\[(18) \quad P_1G'(L_1^*H_1^*)H_1^* - D(H_1^*) > P_1G'(L_1^{**}H_1^{**})H_1^{**} - D(H_1^{**})\]

for some range of values of \(P_1\) with nonzero probability. But with condition (11) this implies \(L_1^* < L_1^{**}\) for this range of \(P_1\). This is a contradiction.

The properties of the solution are of more interest.

**PROPOSITION 1:** During Period zero when the firm is hiring it hires to the point where the expected per-worker marginal product over the two periods is equal to the expected cost per worker, i.e., wage cost plus expected turnover cost.

**PROPOSITION 2:** Hours of work in both periods are set such that the value of the hourly marginal product is equal to the marginal disutility of work.

**PROPOSITION 3:** If the firm lays off workers following a fall in the price, it does so until the net value of the job, i.e., the value of the per-worker marginal product less the disutility of working, is equal to the opportunity cost of a worker's time (income \(Y\) if laid off) less the turnover cost of the layoff.

These three propositions just state in words the maximizing conditions (10), (11), (12), and (14). Proposition 4 requires proof.

**PROPOSITION 4:** If \(P_1 = P_0\), then \(L_1 = L_0\) and \(H_0 = H_1\). There exists a critical price \(P_c\) (\(0 < P_c < P_0\)) such that for \(P_c < P_1 < P_0\) then \(L_1 = L_0\) and \(H_1 < H_0\). There are no layoffs but hours of work are reduced. Also \(H_1\) decreases with lower values of \(P_1\). If \(P_1 < P_c\) there are no further hours reduction, i.e., \(H_1 = H^{\text{min}}\), but \(L_1 < L_0\), i.e., there are layoffs. \(L_1\) decreases with lower values of \(P_1\).

The best way to understand the content of Proposition 4 is to look at Figure 1. This illustrates how the firm's decisions on employment and hours are set in relation to different values of \(P_1\). The solution has a kind of "bang-bang" property. In response to successively lower values of \(P_1\) we see first only a reduction in hours. At some point \((P_1 = P_c)\) there is a changeover to only layoffs with no further reductions in hours. The firm does not immediately make layoffs because it would be inefficient to do so. There are costs associated with turnover, not just \(T\) but also the cost of a spell of unemployment plus mobility costs.\(^{14}\) These costs are borne by the firms and workers and so influence the decision. At some price, however, the net value of the job has fallen to the point where it is more efficient to lay off because the opportunity cost of workers' time is higher than the net value of the job. Once layoffs start there are no further hours reductions because this would lower the net value of the job below the opportunity cost. Some persons looking at this model have wondered whether the firm would ever make layoffs at all. The formal proof is in Lemma 4 below. The intuition is that as

\(^{14}\) This is embodied in the assumption \(V > Y + Y_p\).
hours of work are lowered more and more, wage income will drop. At some point workers will find themselves earning less than UI benefits even if there are no alternative jobs. The proof of Proposition 4 is now developed in four lemmas.

**Lemma 1:** If $L_1 < L_0$, then $dH_1/dP_1 = 0$. This shows that once layoffs start lower values of $P_1$ do not change $H_1$.

**Proof:** If $L_1 < L_0 \Rightarrow \mu = 0 \Rightarrow$ equation (16) is satisfied. But the right-hand side is a constant. Therefore, $dH_1/dP_1 = 0$.

**Lemma 2:** If $P_1 = P_0$, then $H_1 = H_0$, $L_1 = L_0$. If $P_1 < P_0$, then $H_1 < H_0$ or $L_1 < L_0$, or both.

Unless, of course, the wage gets larger and larger. This will not be optimal for obvious reasons. The mathematical condition used in Lemma 4 is that the per-worker marginal product cannot be arbitrarily increased. This condition would also ensure that the firm would not be willing to raise the wage enough to maintain a worker’s income as price fell lower and lower.
PROOF: If $P_1 = P_0$ then $H_1 = H_0$ and $L_1 = L_0$ satisfy (11). Then if $P_0 G'(L_0 H_0) H_0 - D(H_0) > Y - T$ it means (12) is also satisfied and we have found the solution. Suppose instead that $P_1 = P_0$ and $L_1 < L_0$. Then Lemma 1 and equation (11) imply $L_1 < L_0$ for all $P_1 \leq P_0$. Hence from (12):

\[ E[P_1 G'(L_1 H_1) H_1 - D(H_1)] = Y - T. \]

Then since $V > Y + Y \rho$, (15) gives:

\[ P_0 G'(L_0 H_0) H_0 - D(H_0) = V - (Y - T) \rho > Y + T \rho \geq Y - T. \]

But this ensures $L_1 = L_0$ and $H_1 = H_0$ is a solution, by uniqueness the solution—a contradiction. The second statement of the lemma is obvious from (11).

**Lemma 3:** A value of $P_1$ that implies $L_1 < L_0$ will also imply $H_1 < H_0$.

**Proof:** Assume the converse, i.e., for some $P_1$ suppose $L_1 < L_0$ and $H_1 = H_0$. Lemmas 1 and 2 then imply that $H_1 = H_0$ for all $P_1$ such that $0 < P_1 - P_0$. Hence from (10) and (11):

\[ P_1 G'(H_0 L_1) = D'(H_0) = P_0 G'(H_0 L_0). \]

Substituting into (15) gives:

\[ [P_0 G'(H_0 L_0) H_0 - D(H_0)](1 + \rho) = V. \]

But since $V > Y(1 + \rho)$ this means

\[ P_0 G'(H_0 L_0) H_0 - D(H_0) > Y. \]

But whenever $L_1 < L_0$ we have $\mu = 0$ so that (12) gives

\[ P_1 G'(H_0 L_1) H_0 - D(H_0) = P_0 G'(H_0 L_0) H_0 - D(H_0) = Y - T. \]

Since $T \geq 0$ this is a contradiction.

**Lemma 4:** There exists a $P_c > 0$ such that $P_1 < P_c$ implies $L_1 < L_0$.

**Proof:** Assume the converse, i.e., that $L_1 = L_0$ for all $0 < P_1 \leq P_0$. The boundedness of $G'(HL) H$ implies that by choosing $P_1$ close enough to zero we can make $P_1 G'(H_1 L_0) H_1$ as small as we like. But since $L_1 = L_0$ we know that $\mu > 0$ and

\[ P_1 G'(H_1 L_0) H_1 - D(H_1) > Y - T > 0. \]

Since $D(H_1) \geq 0$ we can therefore find a $P_c > 0$ such that $P_1 \leq P_c$ will violate (25).\(^{16}\) The value of $P_c$ is given by:

\[ P_c G'(H_1 L_0) H_1 - D(H_1) = Y - T, \]

where $H_1 = H^{\text{min}}$ satisfies (11) with $P_1 = P_c$, $L_1 = L_0$. This is then the minimum work week, an important parameter for the model. It depends, of course, on $L_0$, $Y$, and $T$. This lemma basically completes the proof of Proposition 4. The only part unchecked is that $H_1$ decreases with lower $P_1$ when $L_1 = L_0$ and that $L_1$ decreases

\(^{16}\)Provided $Y - T$ is bounded away from zero, then so is $P_c$. 

---

**THEORY OF LAYOFFS**

1053
with lower \( P_1 \) given \( P_1 < P_c \). These are both obvious from (11) given that a change in \( P_1 \) changes either \( L_1 \) or \( H_1 \) but not both (from Lemma 1).

5. SETTING THE WAGE RATES

The constraint equation (1) is the condition that determines how \( W_0 \) and \( W_1 \) must be set given the solution for the other variables. But this condition does not by itself determine separately \( W_0 \) and \( W_1 \), only combinations of these variables that would satisfy (1). The mathematical reason for this indeterminacy is that evaluated at \( \lambda = L_0 \) the Lagrangian is flat with respect to \( W_0 \) and \( W_1 \). To understand the reason for this consider:

\[
W_0H_0 + E\left[ \frac{L_1W_1H_1}{L_0} \right].
\]

This expression is both the expected wage cost of each worker hired and the expected wage income each worker receives. For given \( H_0 \) and given distributions of \( L_1 \) and \( H_1 \), we can find any number of pairs \( W_0 \) and \( W_1 \) (including \( W_1 = W_1(P_1) \) that depends upon \( P_1 \) by some decision rule) that leave both the firm and workers indifferent.

This indeterminacy results from an underspecification of the model. First, a necessary condition on \( W_1 \) is:

\[
W_1H_1 - D(H_1) = Y.
\]

This condition must be satisfied in order to avoid workers quitting in Period one. Beyond this, there are alternative ways of closing the model and I shall consider two of these.

The way that fits most closely with ordinary competitive theory is to say that the workers will compete with each other to bid down the wage \( W_1 \) until (28) becomes an equality:

\[
W_1H_1 - D(H_1) = Y.
\]

Assuming workers anticipate that this is what will happen, the firm's initial wage offer is given from (1) by:

\[
W_0H_0 - D(H_0) = V - Y\rho > Y.
\]

Combining (29) and (30) with the solution derived in Sections 3 and 4 gives a unique \( W_0 \) and a unique \( W_1 \) given \( P_1 \). Hence, (29) and (30) close the model. Since an employed worker's income has fallen over the two periods we can describe this as the flexible income policy. Equations (29) and (30) are not only consistent with the solution derived earlier, they reinforce it. They effectively avoid any incentive the firm might have to default on the decision rules given. For example, substituting (29) into (12) gives:

\[
P_1G'(L_1H_1)H_1 = W_1H_1 - T + \mu/\rho.
\]
So whenever there are layoffs and \( \mu = 0 \), (31) says the firm equates the per-worker marginal product to the per-worker wage cost less turnover cost. This is certainly profit-maximizing for the firm as a short-run decision function. The firm cannot default on \( W_1 \) without workers quitting nor on \( W_0 \) because it must attract workers. Since the conditions on hours (10) and (11) are clearly short-run efficiency conditions also, there is no incentive to change \( H_0 \) or \( H_1 \). The necessary compensating changes in \( W_0 \) and \( W_1 \) from (29) and (30) would lower profits. Even with a flexible income policy, this model remains firmly within the long-term-labor-attachment view of the labor market, because workers know correctly the probability distribution of \( P_1 \) and hence \( L_1 \), \( W_1 \), and \( H_1 \). However, there is no implicit contract by the firm in this case since there is no conflict between an announced long-run expected profit-maximizing policy and the firm’s short-run maximizing decisions. Although this is a flexible income policy note that the value of \( Y \) has provided a floor on wage income. Workers will obviously not accept a cut in income when they would rather collect UI benefits and perhaps look for another job. The relationship between wages and hours implied by (29) and (30) is discussed below.

Despite the appealing aspects of the flexible income policy it also has a shortcoming. Following a fall in demand it implies that workers are indifferent between staying or leaving. A layoff has become equivalent to a quit. While this may be true in a few cases, it does not accord with general observation. Suppose, instead, that there is a resistance to cuts in income by workers. One possible reason for this would be that workers are not perfectly risk neutral. This was the main feature of Azariadis [2] and Baily [3]. Another reason recently proposed by Okun [21] is that “fair” behavior by firms is important and income reductions are seen as unfair. A third reason is that a union or perhaps more informal social pressure may make it difficult for workers to compete and bid down wages. By invoking these factors and yet not incorporating them explicitly into the analysis I am cheating. It is, however, important to note that provided workers anticipate the firm’s policy correctly at the point when they are hired, the firm is gaining nothing (in expected profits) by enforcing a flexible income policy. Firms that cut wages during downturns must pay high wages when they hire in order to compensate. What is gained in (29) is lost again in (30). Consider, therefore, an alternative wage policy to (29) where the relation between \( W_0 \) and \( W_1 \) is set by:

\[
W_0 H_0 - D(H_0) = W_1 H_1 - D(H_1) \equiv Y_e.
\]

This condition equalizes the value of being employed across the two periods and thus fits with the notion of risk-reduction or of setting a fair contract. Call this a fixed income policy, where \( Y_e \) is the fixed income value of being employed and is determined from equation (1):

\[
Y_e [1 + E(\frac{L_1}{L_0}) \rho] + [1 - E(\frac{L_1}{L_0}) Y] \rho = V.
\]

Given \( L_0 \) and the distribution of \( L_1 \) this determines a unique \( Y_e \) and since \( V > Y + Y \rho \) it is easy to verify that \( Y_e \) satisfies the necessary condition (28).
Having found $Y_e$, equations (32) then determine schedules for $W_1$ and $W_0$ as functions of $H_1$ and $H_0$. In fact, it is the same function in both cases so that we can derive a single relation:

\[
(34) \quad WH - D(H) = Y_e
\]

that gives the way in which hours and the average hourly wage are related.

Equations (32) and (33) are also perfectly consistent with the earlier solution. Expected profits are maximized at the same maximum as that implied by (29) and (30). It is an implicit contract policy, however. The firm attracts workers in Period zero by means of an offer $Y_e = W_0H_0 - D(H_0)$ with the understanding by workers that the same level of income will be offered in Period one with layoff probability given from the earlier equations. The demonstration given earlier that the firm has no incentive to default with the flexible income policy is also a demonstration that the firm does have such an incentive with (32). The firm can actually raise its profit in Period one by violating the layoff condition (12) or defaulting on $W_1$ and cutting wages. Workers will be annoyed because had they but known that this would happen they would never have joined the firm in Period zero.

Consider now the relation implied by (34):

\[
W = \frac{Y_e + D(H)}{H}, \quad \frac{dW}{dH} = \frac{D'(H)H - D(H) - Y_e}{H^2}
\]

This relation is the smooth curve shown in Figure 2. From (11) and (26) we know that:

\[
(36) \quad D'(H_{\text{min}})H_{\text{min}} - D(H_{\text{min}}) = Y - T < Y_e
\]

so that $W$ must fall as the hours worked increase from their minimum value, although not necessarily by much. The properties of $D(H)$ ensure $D'(H)H - D(H)$ increases without limit as $H$ increases so that there is a point where $dW/dH = 0$ and the average hourly wage is increased beyond this point.

Although the implication of a falling wage with rising hours probably seems very strange, I will argue that a curve with the properties of Figure 2 is not inconsistent with actual practice. There is an approximation to (35) in the form of a piecewise hyperbolic function. Consider the following equation:

\[
(37) \quad WH = F + W_sH_n + W_s(1 + \alpha)H_\alpha + W_s(1 + \beta)H_\beta
\]

where

\[
H_\alpha = \begin{cases} 
H - H_s & H_s < H < H_\alpha, \\
0, & \text{otherwise};
\end{cases}
\]

\[
H_n = \begin{cases} 
H, & H_{\text{min}} < H < H_s, \\
H_s, & \text{otherwise};
\end{cases}
\]

\[
H_\beta = \begin{cases} 
H - H_\alpha & H > H_\alpha, \\
0, & \text{otherwise}.
\end{cases}
\]
The great majority of workers require a significant percentage of their income in the form of fringe benefits \( F \) that are not hours related. Given \( F \) there is a base wage rate \( W_t \) that is paid for each hour worked up to the standard work week \( H_s \). For hours beyond \( H_s \), each hour is paid an overtime premium of \( 100\alpha \) per cent. A typical value is 50 per cent. For hours beyond a certain limit (usually weekend work) a larger premium is paid \( 100\beta \) per cent. A typical value is 100 per cent.

An advantage to the firm of setting its wage policy in the form given by (37) is that such a policy can be set up to give flexibility to the firm in choosing hours of work. Instead of setting \( H \) by fiat and then paying the average hourly wage for each hour, the firm uses overtime premiums. It pays a very high wage for marginal hours and can then operate with a voluntary overtime system. It would be inappropriate to get too involved in the nuts and bolts of empirical wage policies here. These policies may represent a compromise between different factors that are not modelled. The kinked curve in Figure 2 is drawn based upon (37) but deliberately matched to the shape of the smooth curve.\(^{17} \) To what extent this is true in practice would depend on the shape of the disutility of work function.

Consider again the flexible wage policy given by (29) and (30). The relationships between \( W_1 \) and \( H_1 \), and \( W_0 \) and \( H_0 \) have exactly the same shape as the condition

\(^{17} \) Both sides of (37) have been divided by \( H_t \), of course.
(35), the smooth curve in Figure 2. The difference is that the schedule from (29) would be below the curve drawn from (35) while the schedule from (30) would be above. If the firm uses the kind of approximation given in (37) then we would expect the base wage rate and possibly the fringe benefits to fall between Period zero and Period one. The flexible income policy is a flexible wage rate policy. This is in contrast to the fixed income policy which applies the same functional relation between wages and hours to both periods. To be consistent with the most frequently observed short-run wage behavior, therefore, the fixed income policy looks better. This statement does not apply to all firms. Where workers have weak firm attachment, then we might expect a flexible income/wage policy to result. Grossman [15] has recently examined the question of default in implicit contract models, emphasizing however default by workers, i.e. quitting. Further analysis of the sustainability of implicit contracts would be helpful, especially any empirical evidence of alternative cases.

6. THE IMPACT OF THE UNEMPLOYMENT INSURANCE PROGRAM

Workers who are laid off are eligible to receive unemployment insurance benefits. The program is largely self-financing and raises revenue by a payroll tax on covered firms. The tax rate paid by the firm is determined in most states by a so-called experience rating. Such a provision was part of the original Wisconsin program and was adopted as part of the national guidelines. There are a number of different plans and the interested reader can consult Becker [6] or Haber and Murray [16] for details. The most common method is called the reserve-ratio (RR) formula. “For each employer an account is set up to which his contributions are credited and against which benefits paid to his former employees are charged. The ratio of the resulting balance to the employer’s annual payroll is then determined. This is the reserve ratio. The balance is carried forward from year to year and represents the excess or deficit since the program began” [16, p. 335]. The RR formula is operating in 32 states representing 66 per cent of total coverage. The tax rate paid by the firm is determined by its RR and ranges from zero to about five per cent of the wage base. Most other states use a benefit-ratio or benefit wage-ratio plan that also provide an employer incentive effect. However, there are many firms who operate chronically with zero or negative reserve balances and always pay the maximum tax rate. For such firms the marginal tax effect of a layoff is zero. It is also true that in some states there are high minimum tax rates so that a firm may acquire a surplus in its reserve account and once again the marginal tax effect of a layoff is zero. The maximum tax provision is very important. In Massachusetts and New York for example 57 and 59 per cent, respectively, of benefits were paid to former employees of firms with negative reserve balances according to Becker [6]. Therefore, the first case considered will be the effect of a change in UI benefit levels on a firm whose turnover cost $T$ is unaffected by this change, i.e., $dT/dB = 0$. $Y$ is the income of a worker if laid off given by:

$$Y = (B - C)\delta + A(1 - \delta).$$
Workers can affect the duration of unemployment $\delta$ by their choice of $C$, search intensity, and $A$, the acceptance level. In general these choices will be changed by a change in UI benefits, $B$. However, a worker who has been laid off must be made better-off by an increase in $B$. An increase in duration as a result of his own choices will not leave him worse-off. Hence,

$$\frac{d(Y-T)}{dB} = \frac{dY}{dB} > 0.$$  \hspace{1cm} (39)

It will be assumed that $V$ remains a fixed parameter, not changed by changes in $B$. The implications of this will be discussed.

**Proposition 5:** If a firm's turnover cost is unaffected by an increase in UI benefits then an increase in the level of benefits will cause the firm to make more layoffs.

By more layoffs it is meant:

$$\frac{dE[L_0 - L_1]}{dB} > 0.$$  \hspace{1cm} (40)

It is assumed that $P_1 < P_c$ occurs with nonzero probability.

**Proof:** It can be shown that $dL_0/dB > 0$. This is an obvious result since an increase in $B$ raises a worker's expected income for any given firm decisions and, hence, makes workers cheaper to the firm. It will, therefore, hire more of them. Because of the nature of the maximizing conditions, however, a formal proof of this result is lengthy. It is contained in an unpublished appendix.\(^{18}\) Second, we know that whenever there are layoffs $H_1$ is unaffected by changes in $P_1$. There is a minimum work week $H_1 = H^{\text{min}}$ for all $P_1 \leq P_c$. This minimum work week is increased by an increase in $B$. $H^{\text{min}}$ is given by:

$$D'(H^{\text{min}})H^{\text{min}} - D(H^{\text{min}}) = Y - T.$$  \hspace{1cm} (41)

Hence,

$$D''(H^{\text{min}}) \frac{dH^{\text{min}}}{dB} = \frac{dY}{dB} > 0 \Rightarrow \frac{dH^{\text{min}}}{dB} > 0.$$  

Third, we have that $dP_c/dB > 0$. The critical price where layoffs start is increased by an increase in $B$. $P_c$ is given by:

$$P_c G(L_0H^{\text{min}}) = D'(H^{\text{min}})$$  \hspace{1cm} (42)

Hence,

$$\frac{dP_c}{dB} G'(P_c) + P_c G''(P_c) \left[ H^{\text{min}} \frac{dL_0}{dB} + L_0 \frac{dH^{\text{min}}}{dB} \right] = D''(P_c) \frac{dH^{\text{min}}}{dB}$$

\(^{18}\) Available from the author.
which implies \( dP_c/dB > 0 \). Fourth, for any \( P_1 \) such that \( L_1 < L_0 \), then \( dL_1/dB < 0 \). We know:

\[
(43) \quad P_1 G'(L_1 H_{\min}) = D'(H_{\min}).
\]

Hence,

\[
P_1 G''(L_1) H_{\min} \frac{dL_1}{dB} + P_1 G''(L_1) \frac{dH_{\min}}{dB} = D''(H_{\min}) \frac{dH_{\min}}{dB};
\]

this implies \( dL_1/dB < 0 \). Drawing these four results together, we now know that layoffs start at a higher price. We know any price that implies layoffs will imply smaller \( L_1 \). We know \( L_0 \) is larger. Thus the proof is complete.

The implication of this is that because most firms are not liable for UI benefits paid to their workers these firms are subject to a "moral hazard" incentive of the UI system. They can rely on the UI program to pay part of their expected wage bill and so rely on layoffs more than they would in the absence of UI.\(^{20}\) The focus of most of the literature on UI has been on the prolonging of the duration of unemployment by workers. Since we know that a very high proportion of workers return to the firm where they were laid off,\(^{21}\) the incentive to firms may be more important in determining the impact of UI on unemployment than the incentive to workers. Workers on temporary layoff frequently do not search for new jobs at all, so that the effect on their duration of unemployment of variations in benefit levels would be zero—at least for small variations. On the other hand, the case \( \delta = 1 \) means that \( dY/dB = 1 \), there is the maximum incentive impact on firms.

The model presented here is theory of the firm, while changes in UI would have economy-wide impacts. The force of this is that \( V \) was assumed constant to show that \( dL_0/dB > 0 \). This condition is stronger than necessary for the result. \( dL_0/dB \) could be zero or even slightly negative without the result being overturned. The model presented here will not be put into a more general market framework so that its implications for the UI program should be viewed with appropriate caution. To suggest how the model might be generalized, however, recall that \( V \) is the expected income necessary to attract workers to the firm. Suppose there were two sectors in the economy. One sector because of product-market conditions rarely makes layoffs, the other regularly does so. In equilibrium workers are indifferent between the two sectors. Payment of UI benefits \textit{ceteris paribus} will increase the attractiveness of the variable employment sector so that we would expect this sector to increase hiring during booms. The results of Proposition 5 would then go through.

When the price, \( P_1 \), is low enough to induce layoffs we know that employment, \( L_1 \), is reduced by \( B \), but the minimum work week is increased. The firm is to an extent substituting the open unemployment of a layoff for the concealed un-

\(^{19}\) Recall that \( P_c \) is a parameter that changes when \( B \) changes. This is why (42) looks as it does. \( P_1 \) is a given; it is whatever price turns up (within the range \( P_1 < P_c \) being considered).

\(^{20}\) This encouragement to layoffs has been pointed out by Feldstein [9 and 10], Azariadis [2], and Baily [3]. The result was first developed formally (to my knowledge) in Baily [4].

\(^{21}\) Some rather quick manipulation for the NL data [19] shows that in excess of two-thirds of adult males return to their old jobs after layoff.
employment of short-time working. Do the two changes balance out? In general, it depends on the shape of the $G$ and $D$ functions. Let output $Q_1 = G(L_1 H_{\text{min}})$ when $L_1 < L_0$, then:

$$\frac{dQ_1}{dB} = G'(L_1 H_{\text{min}})(H_{\text{min}}) \frac{dL_1}{dB} + G'(L_1 H_{\text{min}}) L_1 \frac{dH_{\text{min}}}{dB}.$$ 

Using (43) we find that $dQ_1/dB$ is negative (given that there are layoffs). Using (10) it is easy to show $Q_0$, output in the initial period, is increased by an increase in $B$. But $Q_1$ when $L_1 = L_0$ (no layoffs) is also increased. Hence, considering the whole range of possible values of $P_1$ one cannot sign the change of output in general.\(^{22}\) One can say that comparing $P_0$ to any price $P_1$ that causes layoffs then output variations are increased by an increase in UI benefits.

The position of firms that are subject to the incentive provisions of the UI tax is very complex. Brechling [7] has examined this question in detail. Rather than attempting to model actual practice explicitly, the opposite case to the one above will be considered, i.e., where firms are fully liable for the benefits collected by workers they lay off. This case gives with its opposite the spectrum of possibilities. It could easily be achieved in practice if desired, by an incentive tax scheme or simply by billing firms for benefits paid. To determine what happens in this case it will be assumed that workers choose their search intensity $C$ and job acceptance level $A$ to maximize $Y$. Specifically:

$$Y = (B - C)\delta + (1 - \delta)A$$

and $\partial Y/\partial C = \partial Y/\partial A = 0$. The effect of a change in $B$ can then be found:

$$\frac{dY}{dB} = \frac{\partial Y}{\partial A} \frac{dA}{dB} + \frac{\partial Y}{\partial C} \frac{dC}{dB} + \frac{\partial Y}{\partial B} \frac{dB}{dB} = \delta.$$ 

Now consider how the turnover cost $T$ is changed by $dB$. If the firm were liable for UI benefits paid to workers laid off, then:

$$\frac{dT}{dB} = \delta + B \frac{d\delta}{dB}.$$ 

For many workers, principally those on temporary layoff, $d\delta/dB = 0$ but for many others duration is prolonged. Thus (46) and (47) give

$$\frac{d(Y - T)}{dB} = \frac{d\delta}{dB} \leq 0$$

with strict inequality holding for some fraction of workers. It was true before that expected duration could change following a change in $B$. Workers were subject to an incentive or "moral hazard". But since the firm was not paying the bill it did not care. Now it does, and in fact firms in setting their own policies will compensate for the change in workers' behavior as a result of UI. With strict inequality in (48) we can run the proof of Proposition 5 with reverse signs.

\(^{22}\) It depends upon the elasticities of $D'$ and $G'$. 
PROPOSITION 6: A firm that is fully liable for UI benefits paid to the workers it lays off will make less layoffs following an increase in UI benefit levels if the laid off workers prolong their duration of unemployment as a result of the higher benefits.

It seems clear, therefore, that making firms liable for benefits paid out would not only eliminate the incentive they have to make more layoffs but would in addition encourage them to compensate for the incentive effect on workers' behavior. It is dangerous to jump to policy conclusions from this, however. If the only concern is minimizing the unemployment rate as a conspicuous indicator of economic success then full liability is indicated. To the extent, however, that such a change simply "locks in" firms, encouraging short-time work during downturns it is not clear how much is gained. The distributional impact of the downturn across workers may be better with short-time work, but it is still a kind of concealed unemployment.\textsuperscript{23}

In the introduction to Proposition 6 it was noted that it did not apply to workers put out on temporary layoff. Indeed, it does not. If firms were liable for UI benefits they would stop putting workers on temporary layoff altogether. Small changes in $B$ would have no impact. This is because the condition $Y - T > 0$ is violated when $Y = B$ and $T \geq B$. This conclusion does not say full UI liability would stop all layoffs. It says full UI liability would stop the current habit of using UI benefits to pay part of the wage bill on a regular basis—hardly a surprising conclusion. It is important to note that full liability as described above would require that UI benefits be taxable. Otherwise firms and workers could, in effect, evade taxes by paying part of the wage bill as UI benefits. Proposition 6 would then become ambiguous and firms would still have an incentive to make temporary layoffs.

7. CONCLUSION

This paper developed a theory of the firm's demand for labor when workers at the time they are hired know that they may later be laid off. The derived behavior showed how the firm, in response to price falls of increasing severity, will first reduce hours of work. After a minimum work week has been reached, layoffs start. The point at which this occurs depends upon the income workers expect to receive if they are laid off. Since UI benefits are an important determinant of this income level they influence the number of layoffs. Given the absence of an effective incentive tax in practice, we would predict that the present UI system encourages layoffs. An effective incentive tax could stop this encouragement.

Two possible wage strategies were explored, both of which are consistent with the basic layoff and hours model. The flexible wage policy has the advantage of giving no incentive to the firm to default on the (privately) efficient layoff rules derived earlier, but seems to be inconsistent with observed short-run wage policy. The fixed wage policy has its strength and weakness the other way around. Different sectors of the economy may behave differently depending upon the

\textsuperscript{23} The discussion of equation (46) is again relevant, with the opposite sign for $dH_{mn}/dB$. In a recent paper (Baily [5]) I began to work out some policy implications for UI. The emphasis was very different, however.
extent of labor-force attachment. In either regime the implied relation between wage and hours worked was found to be approximately consistent with observed schedules.

Yale University

Manuscript received November, 1975; last revision received July, 1976.

REFERENCES


