ROBERT J. GORDON*

University of Chicago and the National Bureau of Economic Research

The Welfare Cost of Higher Unemployment

THE BASIC PROBLEM OF AGGREGATE economic policy is often posed as "the cruel choice between two evils, unemployment and inflation."[1] Although informed policy decisions depend on an accurate assessment of the relative social costs of the two evils in the short run and long run, the welfare economics of inflation has received far more attention in economic analysis than the welfare economics of unemployment.[2] Most previous discussions of the latter have been partial and impressionistic catalogues of the economic and psychological effects of unemployment which make no attempt to analyze cyclical unemployment within the conceptual framework of labor supply theory or to provide quantitative estimates of its welfare cost.[3] And yet any policy decision to induce a temporary recession by

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1. James Tobin and Leonard Ross, "Living with Inflation," *The New York Review of Books*, Vol. 16 (May 6, 1971), p. 23.

2. A concise statement on the welfare economics of fully anticipated inflation and a bibliography of previous contributions is contained in Edward Tower, "More on the Welfare Cost of Inflationary Finance," *Journal of Money, Credit and Banking*, Vol. 3 (November 1971), pp. 850–60. A more extended treatment is contained in Edmund S. Phelps, *Inflation Policy and Unemployment Theory: The Cost-Benefit Approach to Monetary Planning* (Norton, 1972), Chaps. 5 and 6.

3. No attempt will be made here systematically to summarize previous contributions. Among the relevant references are A. R. Dobell and Y. C. Ho, "An Optimal Unemployment Rate," *Quarterly Journal of Economics*, Vol. 81 (November 1967), pp. 675–83;

monetary and fiscal policy in order to moderate inflationary pressure, as in 1968–69, requires a judgment on the social cost of the resulting loss in employment and output.

Recent statements on the welfare cost of the cyclical increase in unemployment during the 1969–70 recession have been extremely casual. One approach has been to calculate the "Okun's law" loss in aggregate output that is statistically associated with a given short-run increase in the unemployment rate.[4] An example is my comment that the cost of the 1969–70 recession, as compared with an alternative policy that would have maintained unemployment at a steady 3.8 percent, was $100 billion in lost output.[5] A quite different but equally casual approach, which ignores the output loss associated with a higher unemployment rate and tends to minimize the welfare cost of the extra unemployment itself, is Milton Friedman's analysis of the effects of an increase in the aggregate unemployment rate from 3.5 to 4.5 percent: "In fact, the number who each week start to look for work would be raised very little—from 530,000 to perhaps 560,000. But these job-seekers would spend on the average an extra week or so finding an acceptable job. . . . The most serious effect would be to raise the number of persons unemployed at any time for more than six months from 180,000 to perhaps 300,000."[6]

This paper attempts to assess the social cost of a 1 percentage point increase in the aggregate unemployment rate caused by restrictive monetary and fiscal policy (as opposed, for instance, to an increase caused by a shift in the demographic, occupational, or geographic structure of labor supply

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Tibor and Anne A. Scitovsky, "Inflation Versus Unemployment: An Examination of Their Effects," in Commission on Money and Credit, *Inflation, Growth, and Employment* (Prentice-Hall, 1964), pp. 429–70; and Phelps, *Inflation Policy*, Chap. 4.

4. For the original statement, see Arthur M. Okun, "Potential GNP: Its Measurement and Significance," in American Statistical Association, *Proceedings of the Business and Economic Statistics Section* (1962), pp. 98–104, reprinted in Okun, *The Political Economy of Prosperity* (Brookings Institution, 1970), Appendix. More recent estimates and evaluations are provided in George L. Perry, "Labor Force Structure, Potential Output, and Productivity," *Brookings Papers on Economic Activity* (3:1971), pp. 533–65, and Arthur M. Okun's paper in this volume. Hereafter this document will be referred to as *BPEA*, followed by the date.

5. Robert J. Gordon, "Inflation in Recession and Recovery," *BPEA* (1:1971), p. 142. Using the same method, Theodore Morgan has estimated the cost of the Great Depression as $470 billion (at 1950 prices). See his *Income and Employment* (2d ed., Prentice-Hall, 1952), p. 119.

6. Milton Friedman, *An Economist's Protest* (Thomas Horton, 1972), pp. 5–6.

and demand). The analysis distinguishes between (1) a *temporary* recession initiated by policy makers to reduce the rate of inflation, such as that in 1969–70, and (2) a *permanent* increase in the goal for the unemployment rate. In neither case will explicit account be taken of the benefits associated with the lower inflation rate made possible by higher unemployment; thus the unemployment rate that is optimal with respect to the direct costs and benefits of unemployment might nevertheless be too low once its indirect inflationary consequences are considered.

No one denies that aggregate policy can cause temporary changes in the unemployment rate, but many question whether it can affect the unemployment rate permanently, causing it to deviate from the so-called natural rate: "there is always a temporary trade-off between inflation and unemployment; there is no permanent trade-off."[7] Nevertheless, the permanent case is interesting for several reasons. First, even if the natural-rate hypothesis is valid, the exact value of the natural rate will always be uncertain, and hence debates will always arise between those who place heavy weight on the risks of an accelerating inflation at a low unemployment target and less weight on the social costs of a relatively high unemployment target, and those who hold the opposite view. Second, the empirical evidence supporting the natural-rate hypothesis for the United States is still sufficiently inconclusive that many economists maintain their interest in the long-run tradeoff. Third, a plausible argument can be made for a long-run tradeoff curve that has a vertical segment above a threshold inflation rate but is negatively sloped below that rate, thus allowing analysis of the optimum location on the negatively sloped segment.[8]

The point of departure for this analysis is Okun's law, which states that a change of 1 percentage point in the aggregate unemployment rate is associated in the short run with a change of roughly 3 percent in the ratio of

7. Milton Friedman, "The Role of Monetary Policy," in *The Optimum Quantity of Money and Other Essays* (Aldine, 1969), p. 104.

8. A theoretical argument for this asymmetry is contained in James Tobin, "Inflation and Unemployment," *American Economic Review*, Vol. 62 (March 1972), p. 11. A long-run tradeoff curve of this type is implied by the variable coefficient model estimated in my "Wage-Price Controls and the Shifting Phillips Curve," *BPEA* (2:1972), pp. 404–06. See also Otto Eckstein and Roger Brinner, *The Inflation Process in the United States*, A Study Prepared for the Use of the Joint Economic Committee, 92 Cong. 2 sess. (1972). The absence of any tendency to an accelerating deflation in 1938–39, despite eight years of unemployment at a rate of 14 percent or above, also suggests that at high unemployment rates the long-run tradeoff curve may be negatively sloped or horizontal rather than vertical.

actual to potential output, and which thereby suggests that productivity, hours, and labor force participation are also altered by a change in aggregate demand. But Okun's law is defective as a means of measuring welfare, because it considers only changes in the value of output sold on the market and ignores those in the value of nonmarket activity. Calculations like my crude $100 billion estimate cited above make the extreme assumption that a zero "price of time" should be imputed to the increase in nonmarket activity by the unemployed, and by those who work fewer hours or leave the labor force. A second major criticism of this approach that is relevant to the case of a permanent increase in the unemployment rate is that the very large elasticity of output with respect to changes in the unemployment rate observed in U.S. postwar recessions is due to short-run disequilibrium phenomena that will tend eventually to disappear.

The paper is divided into three major parts: (1) conceptual analysis of the temporary case, (2) empirical estimates based on previous studies of labor supply behavior and the activities of the unemployed, and (3) conceptual analysis of the permanent case in the context of the neoclassical theory of the demand for and the supply of labor. The empirical estimates are gathered together and summarized in Table 3 below for the temporary case and Table 4 for the permanent case.

Conceptual Framework: The Temporary Case

THE NARROW OKUN'S LAW VIEW

A crude statement of Okun's law can be obtained by manipulation of a few simple identities. Actual real output (Q) is identically equal to output per manhour (q) times manhour input (M). Manhour input (M) can be rewritten as the employment rate (e) times the labor force participation rate (f) times the number of hours per man per time period (H) times the working-age population (P):[9]

$$Q \equiv qM \equiv qefHP. \tag{1}$$

Output and the first four magnitudes on the right-hand side of (1) can be defined at their "potential" values reached at some arbitrary unemploy-

9. With absolute employment denoted by E, and the labor force by F, the right-hand side of (1) can be written out in full: $(Q/EH)(E/F)(F/P)(H)(P)$.

ment rate, say, 4 percent. The ratio of actual to potential real output (Q/Q^*) can be written:

$$\frac{Q}{Q^*} \equiv \frac{qM}{q^*M^*} \equiv \frac{qefH}{q^*e^*f^*H^*}, \tag{2}$$

where potential values are denoted by an asterisk. The percentage change of the ratio of actual to potential output (g_{Q/Q^*}) can be decomposed into its four components: the changes in productivity, in the employment rate, in the labor force participation rate, and in hours per employee:

$$g_{(Q/Q^*)} \equiv g_{(q/q^*)} + g_{(e/e^*)} + g_{(f/f^*)} + g_{(H/H^*)}; \tag{3}$$

here g_x denotes the percentage change in x. Okun's law states that the elasticity of the ratio of actual to potential real output with respect to a change in the employment rate is a constant (k), roughly equal to 3.0.

$$\frac{g_{(Q/Q^*)}}{g_{(e/e^*)}} = k \sim 3.0. \tag{4}$$

Based on this approach, a crude initial estimate of the welfare cost associated with a temporary increase of 1 percentage point in the unemployment rate $(1 - e)$—from, say, 4 to 5 percent—would be 3 percent of real output, about $38 billion per year at 1973 price and output levels. If productivity, labor force participation, or hours did not respond in a recession, the elasticity of the ratio of actual to potential real output with respect to a change in the employment rate would be 1.0 by definition and the welfare cost, by this approach, would be only $12.7 billion instead of $38 billion. Of the remaining 2 percentage points of output response, about 1 point is due to the procyclical response of hours and participation rates as overtime is reduced in a recession and the proportion of workers on involuntary part-time rises, and as secondary workers leave the labor force or delay their entry or reentry when they find jobs scarce. The final percentage point is due to the procyclical response of productivity. While firms can quickly reduce the utilization of capital equipment, they may curtail employment only very little relative to output during a short recession in order to avoid the costs of hiring and firing—recruiting costs, employer-financed investments in training, and severance pay.[10] Another cause of procyclical fluctuations in

10. See, for instance, Walter Y. Oi, "Labor as a Quasi-Fixed Factor," *Journal of Political Economy*, Vol. 70 (December 1962), pp. 538–55, and Donald O. Parsons, "Specific Human Capital: An Application to Quit Rates and Layoff Rates," *Journal of Political Economy*, Vol. 80 (November/December 1972), pp. 1120–43.

productivity is that during recessions, the composition of output shifts away from durable manufacturing with its high productivity levels.

A BROADER VIEW

The basic weakness of the Okun's law approach is its failure to impute a positive value to nonmarket activity. A decline in the number of hours worked in a cyclical recession increases by an equal number the hours devoted to nonmarket activity, which partially offsets the loss in market output. An extreme view might claim that the reduction of market output could be *completely* offset if the recession is assumed to begin from an initial situation of labor market equilibrium at an unemployment rate of, say, 4 percent.[11] To simplify the discussion I assume throughout that the real wage remains fixed in the recession.[12] In the initial equilibrium workers offer their services up to the point at which the real wage rate is equal to the marginal product of an hour of nonmarket activity. If a cyclical recession were to take the form of a one-hour reduction in the workweek for all employees, the recession would cost society virtually nothing, according to this extreme view, since the lost wage would be offset by the marginal product of the hour spent in nonmarket activity.

A formal statement of the role of nonmarket activity helps to clarify the conditions under which this "extreme view" is correct. To simplify the discussion, both the adult population (P) and potential output (Q^*) are held fixed. The total number of manhours available to each individual is 168 per week and is divided between manhours spent on current jobs (M) producing market goods (Q), hours spent by unemployed individuals searching or

11. Positive unemployment occurs in this initial situation despite balance between aggregate labor supply and demand because of search activity by new entrants to the labor force and by employed workers attempting to find more satisfactory jobs, and because of a geographic, demographic, or occupational imbalance between jobs and job seekers.

12. The assumption of a fixed real wage is made to simplify the subsequent analysis and eliminate distributional complications; the aim is to examine the consequences of unemployment associated with a fixed real wage and not to explain the tendency of the real wage to be inflexible in the short run. The rate of inflation of prices and nominal wages is also assumed to be unaffected by the temporary decline in demand, so as to permit concentration on the welfare costs of unemployment and neglect of the distributional effects of unanticipated changes in the rate of inflation. For evidence that the tradeoff curve in the United States is virtually horizontal over a period of one to two years, see the illustration in my "Inflation in Recession and Recovery," p. 138.

waiting for new jobs (U), and hours spent on "home activity" (N), which includes time devoted to consumption, household production (including child care), and sleep. The welfare of households depends on their total output of "final commodities" (Z), which they produce by combining goods purchased on the market (Q) and their own nonmarket time:

$$Z = f(Q,U,N). \tag{5}$$

The production of a meal, for example, requires purchased groceries (part of Q) and hours spent in shopping and cooking (part of N). The time of unemployed individuals (U) is also productive in raising future income, monetary or psychic, as is explained in more detail below.[13]

The aim here is to measure the effect of a change in the employment rate (e) on the output of final commodities:

$$\frac{dZ}{de} = f_Q \frac{dQ}{de} + f_U \frac{dU}{de} + f_N \frac{dN}{de}, \tag{6}$$

where f_Q, f_U, and f_N are the marginal products of, respectively, market goods, unemployed time, and home time in producing final commodities. In equilibrium these marginal products are equal to, respectively, the price of market goods (p_Q), the price per unit of unemployed time (w_U), and the price per unit of home time (w_N), each deflated by the price of the final commodity (p_Z):

$$f_Q = \frac{p_Q}{p_Z}; \qquad f_U = \frac{w_U}{p_Z}; \qquad f_N = \frac{w_N}{p_Z}. \tag{7}$$

The term w_N has also been called, alternatively, "the shadow wage" and "the price of time."

Because the three uses of time exhaust the fixed length of the week, any change in market manhours per week (dM) must be offset exactly by a change in unemployed manhours and home time:

$$\frac{dM}{de} + \frac{dU}{de} + \frac{dN}{de} = 0. \tag{8}$$

The substitution of (7) and (8) into (6), and the decomposition of the change in output (dQ/de) into separate manhour (qdM/de) and productivity

13. This approach to the analysis of household production is an extension of Gary S. Becker, "A Theory of the Allocation of Time," *Economic Journal*, Vol. 75 (September 1965), pp. 493–517. Equation (5) differs from Becker's formulation in giving explicit attention to the search and waiting time of the unemployed.

(Mdq/de) effects, yields the following expression for the response of the output of final commodities:

$$(9) \qquad \frac{dZ}{de} = \frac{p_Q}{p_Z}\left[\underset{[a]}{M\frac{dq}{de}} - \underset{[b]}{\left(q - \frac{w_U}{p_Q}\right)\frac{dU}{de}} - \underset{[c]}{\left(q - \frac{w_N}{p_Q}\right)\frac{dN}{de}}\right],$$

where the letters in brackets identify the separate terms in (9) to facilitate the subsequent discussion.

The total effect of unemployment in (9) is divided into three parts. The first, [a], is the productivity part of the basic Okun's law response and represents the loss in output caused by the decline in productivity per market manhour due to labor hoarding, the drop in capital utilization, and the shifting industry mix of output. If the real wage does not change, the entire loss from lower productivity takes the form of lower net income to capital and lower tax revenues.

The final two terms, [b] and [c], measure the net loss at fixed relative prices of the shift of a unit of time from work to, respectively, unemployed and home time. If w_U/p_Q and w_N/p_Q (the real prices of unemployed and home time) were zero—the simple Okun's law case—each manhour shifted from work would cause the loss of the average product of that manhour (q). But, since these two terms are positive, the value of the loss is less than output per manhour, and would be zero in the extreme case of equality among the three terms.[14] The bulk of this paper consists of a detailed assessment of these two terms, [b] and [c], for the case of a temporary change in the employment rate. The contribution of [a], representing the productivity loss, has been estimated previously and requires no special attention in the temporary case (although it is the main topic in the final section below on the permanent case).

FURTHER CONSIDERATIONS ON THE GENERAL APPROACH

Equation (9) may appear to be incomplete, because it excludes the effect of a changing employment rate on the price of unemployed time and home time. When market output declines and fewer purchased goods are available to be combined with an increased amount of home time, the value of that home time must decline. Similarly, the value of unemployed time is

14. The term outside the brackets, p_Q/p_Z, will simply be 1.0 if both price indexes are defined with the current period as base year.

lower when fewer jobs are available. While these effects do occur, they are completely offset by the increase in the value of the remaining market goods, since relatively more time is available to combine with them (for example, a television set is more valuable when more hours are available for viewing it).[15]

Equation (9) indicates the rather stringent conditions necessary to validate the extreme view that a change in the employment rate would have no effect on welfare. One possibility is that the change in productivity (dq/de) and the terms $[q - (w_U/p_Q)]$ and $[q - (w_N/p_Q)]$ are all zero. Empirical studies of Okun's law indicate that in temporary recessions dq/de is positive. As for the other two terms, real output can be divided between the after-tax real income of labor $[(w/p_Q)M]$, the after-tax real income to capital (K), and the real tax revenue of the government (T):

$$Q \equiv \frac{w}{p_Q} M + K + T. \tag{10}$$

When (10) is divided by total market manhours (M) and when the real price of home time is subtracted from both sides of the equation, the difference between average productivity ($q = Q/M$) and the real price of home time can be written as

$$q - \frac{w_N}{p_Q} = \left(\frac{w - w_N}{p_Q}\right) + \frac{K}{M} + \frac{T}{M}. \tag{11}$$

A similar expression can be written for unemployed time.

Thus the difference between average productivity and the real price of home time can be zero only if the price of home time is equal to the market wage, capital yields no income, and there are no taxes. In the context of the U.S. economy, average productivity must be at least double the real price of

15. The nominal value of final commodity output is identical to the sum of the "payments" to the factors that produce final output:

(a) $$p_Z Z = p_Q Q + w_U U + w_N N.$$

After both sides of (a) are divided through by p_Z, the total response of real final commodity output to a change in the employment rate is

(b) $$\frac{dZ}{de} = \frac{p_Q}{p_Z}\frac{dQ}{de} + \frac{w_U}{p_Z}\frac{dU}{de} + \frac{w_N}{p_Z}\frac{dN}{de} + Q\frac{d(p_Q/p_Z)}{de} + U\frac{d(w_U/p_Z)}{de} + N\frac{d(w_N/p_Z)}{de}.$$

But when equation (7) is substituted into (6), dZ/de is equal to the first three terms of equation (b). Therefore the final three terms, representing the effect of a changing employment rate on the relative prices of market commodities, unemployed time, and home time, must sum to zero.

home time, since the income of capital and tax revenues make up almost exactly half of gross national product (GNP).[16] Thus in the temporary case the shift of a manhour away from market activity causes the loss not only of the after-tax wage per hour, but also of the income earned on that hour by the (fixed) capital stock and all the sales, corporate, and personal taxes earned by government.[17] Therefore, from the outset the extreme view is plainly incorrect in the case of a temporary recession, since all three terms in (9) are positive. For the extreme view to be correct in the permanent case, a reduction in the unemployment rate must cause a sufficient decline in productivity (that is, dq/de must be sufficiently negative) to offset the positive contributions of the last two terms in equation (9), which represent the higher value of working rather than not working for those who would like to be employed.

Some commentators have claimed that (11) is irrelevant in a world with $w = w_U = w_N$ and no taxes on the grounds that a reduction in the employment rate can cause no change in final commodities ($dZ/de = 0$) even if the income of capital is positive. But this is incorrect in the temporary case because, as long as the income of capital is positive, $[q - (w/p_Q)]$ is positive; and thus the net effect in (9) can be zero only if dq/de is sufficiently negative —that is, if productivity *increases* when the employment rate declines in a recession. However negative the value of dq/de may be in the permanent case (discussed below), the empirical fact is that it is positive in the temporary case and therefore dZ/de is positive even in the absence of taxes.

The general expression (9) may also appear to be incomplete in its failure to include unemployment compensation explicitly. Surely, some may remark, the welfare cost of higher unemployment must depend inversely on the size of unemployment benefits; unemployed individuals must be better off now than was a person unemployed for the same duration in the 1930s. This view is true for the individual. But it ignores the distinction between the private cost of unemployment, which is reduced by unemployment compensation, and the social cost, which may be increased as the compensation induces individuals to remain unemployed longer. In this sense unemployment compensation is not irrelevant to calculations of welfare cost, as one might be tempted to argue on the grounds that it is simply a transfer

16. In 1971 compensation of employees minus personal tax and nontax payments was $527.1 billion, or 50.2 percent of GNP.

17. Depreciation is assumed to be a function of time rather than of capital utilization. Therefore, a reduction in labor input causes a reduction in *gross* income to capital without any offsetting saving in the form of reduced depreciation.

from one set of individuals to another that does not affect the total real income available to society. Like most taxes and subsidies, unemployment compensation produces a substitution effect, which reduces the price of unemployed time relative to work and with it the total amount of final commodities (Z) available to society.

Also missing from (9) are explicit terms for changes in formal education and on-the-job training. Time spent in formal education is classified with home time (N), and the return per hour of education is considered a part of the shadow price of home time (w_N). Formal education therefore causes no problem other than those of any other use of home time if the shift of an hour from work to that activity is evaluated at the appropriate shadow price. Both employee- and employer-financed on-the-job training have two effects that in principle should be taken into account. First, they raise the return per hour of "work" above market output per manhour (q) and cause the two final terms of (9) to underestimate the social cost of the shift of an hour from work to unemployed or home time. Second, on-the-job training may depreciate during unemployment or a spell out of the labor force, imposing a social cost—"unlearning-by-not-doing"—beyond that written explicitly in (9). While these effects are not included in (9) to keep that expression relatively simple, a crude estimate of their relative importance will be made below.[18]

The Economics of Searching and Waiting

How does higher cyclical unemployment affect the price of unemployed time? Can a conclusion be reached on the approximate empirical magnitude of the net sacrifice in income when hours shift from work to search:

$$\left(q - \frac{w_U}{p_Q}\right) dU?$$

18. A minor problem is raised by the use of derivatives in (9) to measure changes that may be relatively large. Consumer surplus can be measured accurately if the price terms in (9) are evaluated midway between their initial and final values, as in the discussion of the price of home time below. If for example $w_{U2} = w_{U1} + \Delta w_U$, and the estimate $\hat{w}_U = 0.5(w_{U1} + w_{U2})$ is used, the term $\hat{w}_U \Delta M$ becomes $w_{U1}\Delta M + 0.5\Delta w_U \Delta M$ and is identical to expression (5′) in Arnold C. Harberger, "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay," *Journal of Economic Literature*, Vol. 9 (September 1971), p. 788. The present paper values the shift of an hour away from work activity at the excess of its marginal social benefit over its marginal social cost and thus is consistent with the postulates in Harberger's essay, in which a number of possible objections to the approach are considered and rejected.

The idea that *extra* search time has a value that is deducted from the net sacrifice of higher unemployment may appear to pose a paradox. Some may argue that it is higher unemployment itself that imposes the burden of extra search, and dispute a conceptual framework that appears to treat the value of unemployed time as a positive quantity rather than as a deadweight loss.

The view that extra unemployed time caused by a recession is a deadweight loss rests, however, on an arbitrary application of the distinction between voluntary and involuntary unemployment. The proponents of this view may agree that (except for structural unemployment) the unemployment in initial equilibrium serves the social purpose of sorting workers into the most appropriate jobs.[19] But, they would claim, an upward departure from this equilibrium unemployment rate serves no such purpose, since employees who in equilibrium were content with their jobs are now searching against their will. However, the price of unemployed time (w_U) must be positive if it has a positive opportunity cost, and the victims of cyclical unemployment have at least two alternatives: They may either consume home time having a price w_N or engage in market work activity that is instantaneously available without search, for example, selling apples at an hourly wage of w_a. These alternatives set a minimum value for the price of search time. In this sense unemployment that appears to be involuntary is actually voluntary, since the unemployed can choose not to look for a job if the hourly return to unemployment falls below these minimum levels. A married woman may have a high value of w_N relative to w_U when her children are small, but she may enter the labor force as her children reach the age at which her w_N falls below her w_U.

The mere fact that the price of search time is positive does not necessarily mean that it is high relative to the previous market wage. The prices of search time and of home time, and the hourly return from selling apples, may all be sufficiently low (or even negative for some adult males) to reduce substantially the income of an individual who loses his job in a recession. While some would underestimate the price of search time by assuming it to be zero, others may overestimate it by setting it equal to the reservation price or acceptance wage of the unemployed (that is, the minimum wage at

19. A large percentage of both quits and layoffs affects employees with very short job tenure, presumably reflecting, in the case of quits, dissatisfaction with jobs by the employees and, in the case of layoffs, dissatisfaction with employees by firms. See Robert E. Hall, "Turnover in the Labor Force," *BPEA* (3:1972), p. 723.

which an unemployed individual will accept a job). The social opportunity cost is lower than the after-tax acceptance wage by the amount of any unemployment compensation or welfare payments that society gives to the unemployed individual.

THE PRICE OF TIME DURING UNEMPLOYMENT

The price of unemployed time can be defined more precisely by considering in some detail the decision to accept or refuse a job offer. The marginal cost of refusing a job offer at the acceptance wage (y) is the forgone income at that wage rate, net of taxes and earning costs (commuting, uniforms, for example) amounting to a fraction (h) of the forgone income:[20]

$$MC = (1 - h)y. \tag{12}$$

The time period over which (12) applies is the expected interval between job offers, which might be one day or six months.

In considering a job offer, the unemployed individual balances the cost of refusal, given by (12), against the marginal return from refusal, which has several elements: (1) for a worker who has been laid off, the prospective value of recall to his old job at his old wage (w_0), where w_0 is greater than y; (2) to a worker who continues searching, the prospective value of an offer at the mean value of acceptable offers (x), where x is greater than y; (3) to a worker who continues some minimum amount of search activity, the value of unemployment compensation benefits (b) and the cost of expenditures for search, such as bus fares, shoe leather, and the like, $c(s)$, which depend on the fraction of time devoted to search, s; (4) to a worker who spends only a fraction (s) of his time searching, the value of home time consumed, $(1 - s)w_N$.

In Appendix A, these elements of the marginal return to refusing an offer at the acceptance wage are developed in a formal model. Together with equation (12), expressing the marginal cost of refusing an offer, the model is used to derive several results that characterize the search process. The model is also used to check some of the empirical results presented below that are based on equation (12).

20. My treatment of commuting costs as equivalent to a proportional income tax assumes that the value of time spent in commuting is proportional to the wage rate and that there are no nonproportional elements of transport cost.

The price of unemployed time (w_U) required for the purpose of this paper is the return to society of job refusal, consisting of the return to the unemployed individual minus the unemployment benefits paid by the rest of society to the unemployed. This price (w_U) can thus be expressed as either marginal cost in (12) or marginal revenue as developed in Appendix A, in both cases reduced by the amount of unemployment benefits. Using the expression for marginal cost, the result is

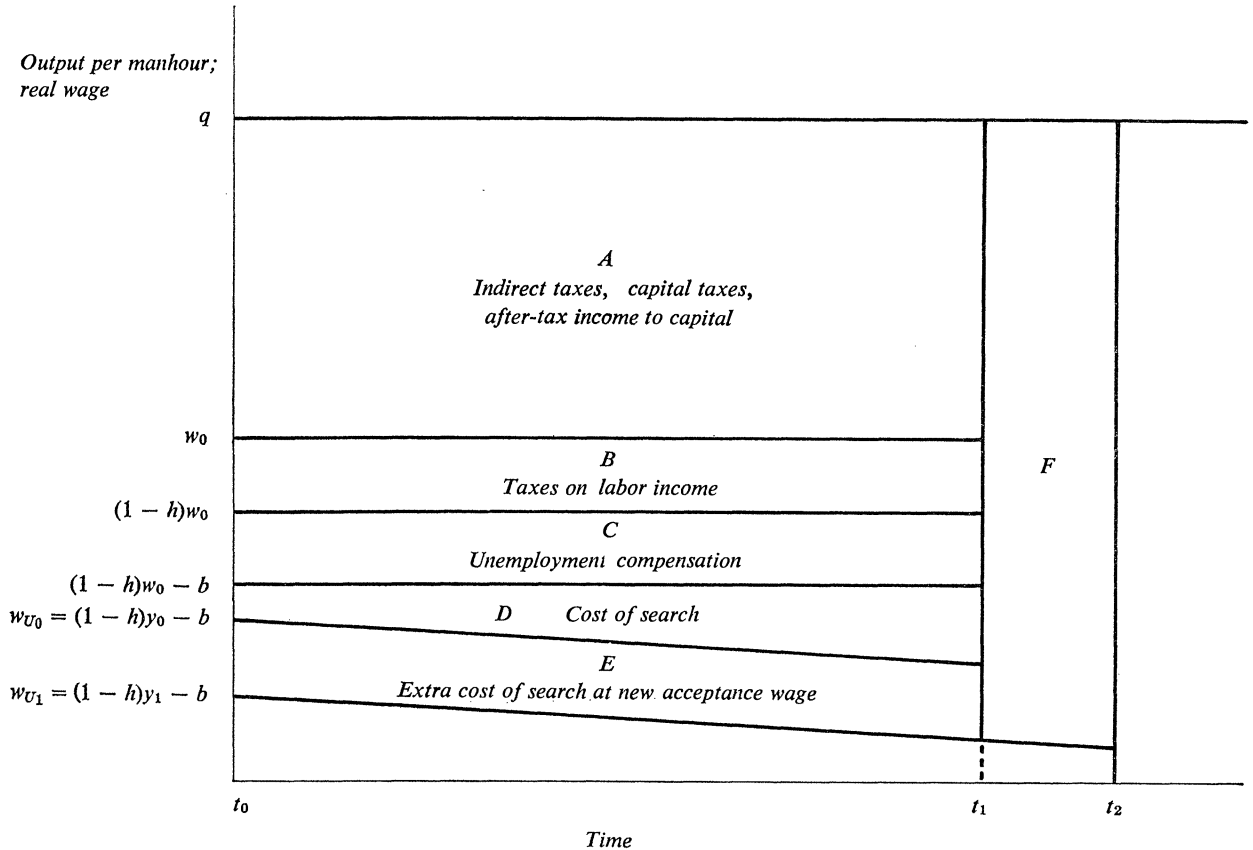
$$w_U = (1 - h)y - b. \tag{13}$$

The minimum acceptable wage set by an unemployed individual defines his *private* opportunity cost in activities other than work, but his *social* opportunity cost is reduced by the amount of unemployment compensation, since his acceptance of a job confers on society an external benefit in the form of lower taxes to finance unemployment compensation. A possible "congestion" effect, which further reduces the social relative to the private opportunity cost, would be imposed if the decision to refuse a job lowered the probability of finding a job for others, but this refinement is not made here.

Figure 1 decomposes the social cost of time spent in unemployment. In the initial situation unemployment has an average duration $t_1 - t_0$, with a shadow price of unemployed time of w_{U_0}. The welfare cost consists of capital income and taxes (areas $A + B$); unemployment compensation (area C); and the cost of search activity (area D), which depends on the acceptance wage (y_0) and which reduces the minimum acceptable wage below the expected wage offer.[21] Together, these four areas measure the social cost per person unemployed. In a recession the reduction in the acceptance wage from y_0 to y_1 for any given duration of unemployment imposes an extra cost (area E) on each original hour of unemployment. In addition *extra* hours of unemployment are experienced as both the number of unemployment spells and their average duration rise. In the new situation, each spell has an extra social cost measured by extending the average duration of unemployment (area F). At recession values of the price of unemployment (w_{U_1}) and of duration ($t_2 - t_0$), the social welfare cost for each of the larger number of spells is now equal to the total value of areas A through F.

21. The diagram assumes that the mean expected wage (x) is equal to the previous wage (w_0). If search were costless, the minimum acceptance wage would be set equal to x, since marginal revenue is zero in appendix equation (A-2) when $y = x$ and when $\beta = b = c = 0$ and $s = 1$.

Figure 1. The Social Cost of Time Spent in Unemployment[a]



a. w_0 = wage on old job; h = tax rate; w_U = price of unemployed time; y = acceptance wage; b = unemployment benefits.

Table 1. Evidence on the Price of Job Search Time, Seven Studies, Various Years, 1961–71[a]

Study (*1*)	*Company* (*2*)	*Location* (*3*)	*Year* (*4*)	*Sample size* (*5*)	*Group covered* (*6*)	*Previous wage (hourly or weekly)* (w_0) (*dollars*) (*7*)	*Relative acceptance wage* (y/w_0) (*percent*) (*8*)	*Rate of decay per month of* y/w_0 (*percent*) (*9*)	*Relative wage on new job* (w_1/w_0) (*percent*) (*10*)	*Rate of decay per month of* w_1/w_0 (*percent*) (*11*)	*Relative unemployment compensation* (b/w_0) (*percent*) (*12*)
1. Dorsey	Mack	Plainfield, N.J.	1961	367	Men	137.00	71.8	...	62.0	1.93	36.5
2. Folk and Hartman	Boeing, Republic Aviation, Martin	Seattle, Long Island, Denver	1963–64	14,333	Men and women	125.60	92.6	...	93.3	...	...
3. Kasper	...	Minnesota sample of filees for unemployment insurance	1961	3,000	Men and women	1.92	97.9	0.38	...	...	...
4. Perrella	...	U.S. sample	1969	...	Men, 16–21	1.93	87.0	...	...	...	...
					Women, 16–21	1.77	92.7	...	...	...	...
5. Sheppard and Belitsky	...	Erie, Pa.	1963–64	309	Men	2.12	74.9	...	105.2	...	...
				146	Women	1.50	80.6	...	91.3	...	...
6. Stephenson	...	Indianapolis	1971	281	Men, 18–21	2.35	83.8	1.42	...	...	...
7. Wilcock and Franke	ABC[b]	Peoria	1959	472	Men and women	2.22	...	...	88.7	...	36.6
	Armour	East St. Louis	1959	1,331	Men and women	2.20	...	...	84.5	...	36.9
	Armour	Columbus, Ohio	1959	290	Men and women	2.20	...	...	90.9	...	36.9
	Armour	Fargo	1959	299	Men and women	2.20	...	...	77.3	...	36.9
	Armour	Oklahoma City	1960	237	Men and women	2.33	...	...	58.8	...	34.9

Sources: See Appendix B.

a. w_0 = wage on old job; y = acceptance wage for new job; w_1 = wage on new job; b = unemployment compensation.

b. The ABC Company had been a manufacturer of home laundry equipment.

Empirical Evidence on the Social Cost of Unemployment

The task of this section is to measure the effect of higher cyclical unemployment on the social cost of unemployed time, as represented in (9) by the term

$$\left(q - \frac{w_U}{p_Q}\right) dU,$$

and this requires data on two magnitudes that are not reported in the aggregate labor force statistics: the price of unemployed time (w_U) and the number of hours shifted into unemployment (dU).[22] Two methods are available for estimating the price of unemployed time (w_U), based either on (13), which states that w_U equals the after-tax acceptance wage minus the rate of unemployment compensation, or on appendix equation (A-2), which requires much more information on the components of marginal revenue from refusing an offer. Here the first route will be used to estimate the level of w_U; Appendix A uses plausible values of the elements of marginal revenue to provide a cross-check on these results. The following sections of the text turn to the estimation of hours spent in unemployment (U) and their response to higher unemployment (dU/de).

THE PRICE OF UNEMPLOYED TIME

Relevant evidence on the price of unemployed time is collected in Table 1 from several studies of unemployed individuals. Lines 1, 2, and 7 are studies of workers displaced by plant shutdowns; lines 4 and 6 refer to unemployed teenagers; and lines 3 and 5 concern search activity of all demographic groups without restriction on the source of unemployment. The table summarizes information available on the relation between the wage rate on previous jobs (w_0) and both the acceptance wage (y) and the wage rate on accepted jobs (w_1). Also listed are the monthly rates of decay of the acceptance or offer wage rate and the ratio of unemployment benefits to the wage rate on the previous job. Numerous cells are empty because the studies asked widely different questions.

22. The price of market output (p_Q) is an index number and can be arbitrarily set at 1.0.

The range for relative acceptance wages (y/w_0) is quite wide at first glance—from 71.8 to 97.9 percent of the previous wage rate—but closer inspection narrows it. Kasper's high figure should be excluded since it resulted from the question "What wage . . . are you (currently) seeking?" and thus differs from the desired concept of a *minimum* wage below which an offer will be refused.[23] The other studies asked specifically about minimum acceptable wages; for example, Sheppard and Belitsky asked: "When you've been looking for a new job, do you have some hourly wage or weekly salary that you won't go below—that is, do you have in mind some *minimum* wage or salary? [If so,] what is the hourly rate, or weekly salary?"[24]

Another possible ground for excluding certain responses is a previous wage that was relatively high or low. In the large sample of displaced defense workers surveyed by Folk and Hartman, the ratio y/w_0 has a strong negative relation with the level of w_0.[25] This result might be explained by a variant of the permanent income hypothesis: Workers at either extreme might consider their previous wage unusual and expect the wage on their next jobs to be closer to the average in the community. High-wage defense workers may have been working with relatively large amounts of firm-specific human capital which the plant shutdowns made obsolete, while the low-wage workers may have been relatively unskilled and may have expected to remain so on their next job. In the case of Dorsey's study, the

23. Hirschel Kasper, "The Asking Price of Labor and the Duration of Unemployment," *Review of Economics and Statistics*, Vol. 49 (May 1967), p. 168. Stanley Stephenson included both types of questions in his study:

(a) "What hourly wage rate or weekly take home pay would you like to earn on this job you are looking for?"

(b) "What is the minimum hourly wage rate or minimum weekly take home pay you would accept at present?"

Stephenson has informed me that the mean response to (a) was $2.78 for whites and $2.74 for blacks, but that to (b) was only $2.00 for whites and $1.93 for blacks. See Stanley P. Stephenson, Jr., "The Economics of Job Search: A Biracial Analysis of Youth Job Search Behavior" (paper presented at the 1972 annual meeting of the Econometric Society; processed).

24. Harold L. Sheppard and A. Harvey Belitsky, *The Job Hunt: Job-Seeking Behavior of Unemployed Workers in a Local Economy* (Johns Hopkins Press, 1966), p. 39. The figures in column (8) of Table 1 include only those individuals who answered "yes" to the first question (69 percent) and are subject to an unknown bias from the omission of the remainder.

25. Computed from frequency distribution in Hugh Folk and Paul Hartman, *Pensions and Severance Pay for Displaced Defense Workers* (U.S. Arms Control and Disarmament Agency, 1969), Table IV-9, p. 114.

low ratio of y/w_0 can be explained similarly by the high previous wage level, which workers knew was due to an aggressive union and would not be attainable once the Mack plant had closed.[26] At the other extreme, the minimum acceptance wage of teenagers in the Perrella study responds less with age than the actual wage, so y/w_0 declines from 96 percent in the youngest group (16–17 years) to 82 percent in the oldest (20–21) years.[27] The discrepancy between the Perrella and Stephenson results for teenagers is explained almost entirely by the older average age of Stephenson's sample and its limitation to males.

Because the Sheppard and Belitsky study includes a random sample of unemployed workers rather than just that subset caused by a plant shutdown, and their group would not appear to have had atypical previous wage rates, their values of y/w_0 for adult men and adult women seem reasonable estimates for the United States as a whole. Perrella's values will be used for teenagers, since they are consistent with Stephenson's but cover a larger and more representative sample. Because evidence on the rate of decay of the acceptance wage as time passes is so scanty, I assume a constant y/w_0 ratio throughout unemployment.

The next ingredient in the estimation of the price of search time is the rate of unemployment compensation relative to the previous wage rate. The ratios of about 36 percent reported in column (12) of Table 1 understate the size of unemployment benefits for those covered by the unemployment insurance program, both because programs have been liberalized since the early 1960s and because benefit rates must be compared with after-tax rather than before-tax wage rates. In 1971 the average weekly benefit paid under state unemployment insurance programs was $54.59.[28] Average gross weekly earnings in the private nonagricultural economy, adjusted for fringe benefits, were $142.55.[29] Thus the benefit-earnings ratio appears to be 38.3 percent.

26. "In a letter to the employees on October 10, 1958, the company indicated its dissatisfaction with the incentive wage situation, which at that time provided an average incentive rate for Mack workers of over $3.50 an hour, as compared with the average rate elsewhere in the automotive-truck manufacturing industry of $2.51 an hour." John W. Dorsey, "The Mack Case: A Study in Unemployment," in Otto Eckstein (ed.), *Studies in the Economics of Income Maintenance* (Brookings Institution, 1967), p. 177.

27. Vera C. Perrella, "Young Workers and their Earnings," *Monthly Labor Review*, Vol. 94 (July 1971), Table 1, p. 4. Age-specific results are not presented separately by sex.

28. *Monthly Labor Review*, various issues, statistical section, Table 10.

29. Average weekly earnings from *Economic Report of the President Together with*

But this estimate is faulty for at least two reasons: because only a fraction of the unemployed receive unemployment benefits, and because the average earnings of those who become unemployed are lower than the average for all employed individuals. In 1971 only 43.1 percent of the unemployed were covered under the state unemployment insurance program.[30] Many of the remainder were teenagers living with their parents, or wives whose husbands remained employed; neither of these two groups would have been eligible for welfare or food stamps. Some of the uncovered unemployed—for example, teenagers living alone, single adult women, and adult males in uncovered industries—may have received welfare payments or food stamps, which are conceptually identical to unemployment benefits if they are contingent on remaining unemployed. In the absence of detailed information, 20 percent of the uncovered unemployed will be assumed to have received other government compensation, raising "effective" coverage to 54.5 percent, which, when multiplied by the average covered benefit of $54.59, yields an "effective" benefit of $29.75.

As for the average previous wage (w_0) of the unemployed, a study by the Bureau of Labor Statistics of those unemployed five weeks and more in 1961 found that, on the average, they had earned about $70 per week on their last job, whereas average weekly earnings adjusted for fringe benefits in 1961 were $89.87.[31] In 1971 the average previous wage of the unemployed was presumably lower relative to average hourly earnings because during the previous decade the composition of the unemployed had shifted toward women and teenagers to a greater extent than the composition of the employed. This demographic shift implies a 1971 average wage of the unemployed equal to 69 percent of the average hourly earnings of the employed, or $98.31.[32] An adjustment for taxes and commuting expense brings the

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the Annual Report of the Council of Economic Advisers, January 1973, Table C-31. Hereafter this document will be referred to as *Economic Report*, followed by the year. The adjustment for fringe benefits is calculated as the ratio of compensation of employees to wages and salaries; *ibid.*, Table C-15.

30. *Manpower Report of the President, 1972*, Tables A-14 and D-5. Hereafter this document will be referred to as *Manpower Report*, followed by the year.

31. Earnings on last job of the unemployed is from Robert L. Stein, "Work History, Attitudes, and Income of the Unemployed," *Monthly Labor Review*, Vol. 86 (December 1963), p. 1410. Average hourly earnings adjusted for fringe benefits in 1961 is from *Economic Report, 1973*, Table C-31.

32. Using separate weights for eight age-sex groups, the ratio (R) of the average wage with unemployment weights to the average wage with employment weights fell from

relevant after-tax weekly earnings figure down to \$61.20, and thus the "effective" unemployment benefit is 48.6 percent of the relevant after-tax wage rate.[33]

These estimates can now be combined in an estimate of the price of search time if equation (13) is rewritten:

$$w_U = \left[\frac{y}{w_0} - \frac{b}{w_0(1-h)}\right] w_0(1-h). \tag{14}$$

The estimate of w_U is then only 34.2 percent of the previous after-tax wage, or only \$20.93 per week for 1971.[34] It thus pays the average unemployed individual to remain unemployed if the expected present value of an extra week of search exceeds \$20.93. This estimate, as small as it may seem, probably overstates the price of search time, since it ignores the congestion effect of job refusal in reducing the price of search time for others.

0.881 in 1961 to 0.780 in 1971, where

$$R = \frac{\Sigma I_i U_i}{\Sigma I_i E_i};$$

I_i is average weekly earnings of group i relative to males aged 35–44, from George L. Perry, "Changing Labor Markets and Inflation," *BPEA* (3:1970), p. 440, and U_i and E_i are, respectively, the shares of total unemployment and employment of group i, from *Manpower Report, 1972*, Tables A-10 and A-15. The 1961 survey estimated the average previous wage of the unemployed to be 77.9 percent of average hourly earnings; this fraction multiplied by R_{1971}/R_{1961} corrects for the demographic shift between the two years if the relative wages *within* each demographic group remained constant.

33. Two months of unemployment would cause a loss of income of \$852.02, which in 1971 would reduce personal income tax liability by \$152.00 on the assumption of a joint return using standard deductions filed by a married couple with two children. Social security contributions would be reduced by \$44.31, and state income tax in, for example, Illinois would be reduced by \$21.30 (a rate of 2.5 percent on income above an exemption of \$1,000 per person). This amounts to an effective marginal rate of 25.5 percent, compared with 26.8 percent calculated by Feldstein for a similar situation in Massachusetts; see "Lowering the Permanent Rate of Unemployment," Preliminary Report prepared for the Joint Economic Committee by Martin S. Feldstein and Associates (no date; processed), p. 79. In addition, I make an adjustment for commuting expense of \$4.50 per week (five round trips without transfers at current fares on the Chicago Transit Authority), plus \$1.50 per hour for five hours per week for the loss of home time during commuting.

34. The first term in (14), y/w_0, is a weighted average of the values in Table 1, column (8), for the Sheppard-Belitsky and Perrella studies. Weights are based on the share of the increase in unemployment between 1969 and 1971 of six demographic groups, men and women aged 16–19, 20–24, and 25 and over. The value of y/w_0 for men and women 20–24 is assumed to be a simple average of the values for the 16–19 and 25 and over groups. The result of this calculation is a weighted average of 0.828, minus the value of $b/[w_0(1-h)]$ calculated above of 0.486, which equals 0.342 of the after-tax wage of \$61.20.

HOURS SPENT IN SEARCH

No evidence on the intensity of search activity is available for an economy-wide sample.[35] But the scattered evidence appears to imply many fewer than forty hours per week devoted to search, and suggests that unemployment increases home time considerably more than search time, even for those who do not expect to be rehired. Since the estimates of hours spent in search do not play a crucial role in the final conclusions on the welfare cost of higher unemployment, the detailed discussion of the evidence is relegated to Appendix C. The outcome is an estimate that the average unemployed individual spends only about 8.4 hours per week in search activity.

The Price of Home Time

The low apparent intensity of search activity derived from the scattered evidence in Appendix C suggests that recent economic theory may have put too much emphasis on the economics of search and too little on the "economics of waiting." Furthermore, the distinction between conventional and disguised unemployment virtually disappears in light of this evidence that both groups are primarily occupied with home activity. Of those who are past the first month of relatively intensive search, the subset that claims to have searched in the past four weeks and is thereby classified as unemployed may be distinguished from the subset classified as "not in labor force" more by its desire to retain unemployment benefits than by a significantly different pattern of daily activity.

Previously suggested imputations for the price of nonmarket activity have ranged from the market wage rate in studies of passenger transport to Tobin's suggestion that the time spent by laid-off employees awaiting recall is a "deadweight loss," perhaps influenced by remarks in Bakke's depression case studies—"My time has no value," and "Of course if I figured in

35. Aggregate data are collected only on the number of job-search techniques used, not on the frequency of their use (for example, the number of visits to firms) or on the number of hours devoted to each technique; they are reported for 1970–71 in Thomas F. Bradshaw, "Jobseeking Methods Used by Unemployed Workers," *Monthly Labor Review*, Vol. 96 (February 1973), pp. 35–40.

my own time, that wood would cost me as much as if I bought it, but my time isn't worth anything when I don't have a job."[36]

As long as work does not yield utility directly (beyond the money it provides)—an assumption to be questioned below—the standard assumption is that, for participants in the labor force, "the value of their time equals their wage rate."[37] Labor force participants are assumed to vary their hours of work (H) to equate the market real wage rate to their real price of time (w_N), which can be defined by

$$W_{N_i} = f(H(e), w_j(e), A), \tag{15}$$

where i refers to one family member, w_j is the real market wage of the other family member, and A is the nonwage income of the family.[38] Both H and w_j are written as functions of the aggregate employment rate to reflect the effect of a cyclical recession on hours and unemployment of other family members. The cyclical response of w_{N_i} is then the total derivative of (15) with respect to the aggregate unemployment rate:

$$\frac{dw_{N_i}}{de} = \frac{\partial f}{\partial H}\frac{dH}{de} + \frac{\partial f}{\partial w_j}\frac{dw_j}{de}. \tag{16}$$

Here, $\partial f/\partial H$ is the inverse of the uncompensated substitution effect of an increase in the market wage on work effort; when this term is positive, as it appears to be in most studies for married women, a cyclical decline in hours causes a reduction in the price of time. Similarly, for married women, $\partial f/\partial w_j$ is the effect of the husband's wage on the wife's price of time and is presumably positive. Both the husband's earnings and nonwage income provide goods that raise the marginal product of home time, and thus a

36. E. Wight Bakke, *The Unemployed Worker: A Study of the Task of Making a Living Without a Job* (Yale University Press for the Institute of Human Relations, 1940), pp. 169, 200. For a brief survey of the literature on passenger transport see Reuben Gronau, *The Value of Time in Passenger Transportation: The Demand for Air Travel* (Columbia University Press for the National Bureau of Economic Research, 1970), pp. 57–58.

37. Reuben Gronau, "The Intrafamily Allocation of Time: The Value of the Housewives' Time" (paper presented at Conference on Research in Income and Wealth, November 4–6, 1971; processed), p. 6.

38. A similar equation is formally derived in Appendix I of James Heckman, "Shadow Prices, Market Wages, and Labor Supply," working paper (National Bureau of Economic Research, October 1972; processed). Heckman's equation (3) differs only by including extra terms for prices of goods (assumed constant in this paper) and for previous events exogenous to the current problem, for example, education and children.

cyclical decline in the husband's earnings through unemployment or short hours reduces the wife's price of time.

Most recent labor supply studies have emphasized estimation of the labor supply response in (16) and have provided little information on the level of the price of time. Yet the crude assumption that the price of time equals the market wage is unsatisfactory for several reasons.

First, personal direct taxes and commuting costs drive a wedge between the value of a worker's marginal product and his net earnings. Since his labor supply decisions presumably depend on the latter, the price of home time must lie below the level of average hourly (gross) earnings.

Second, just as unemployment benefits reduce the price of search time relative to the acceptance wage, so the availability of welfare benefits reduces the price of home time. Any government payment that is contingent on not working has the same effect as direct taxes on work income.

Third, even without taxes the acceptance wage lies below the average market wage when search is costly and requires the sacrifice of earnings to locate jobs paying a wage rate above the acceptance wage.

Fourth, any negative or positive psychic income yielded by work must be added to the market wage before it is compared with the price of time.

Finally, for nonparticipants in the labor force no observation is available on the market wage. The price of time is presumably higher for nonparticipants than for others with the same education and skills, but by an undetermined amount.[39] Fortunately, this problem is not serious here, because the analysis requires an estimate of the price of time only for those who reduce their hours of work or lose their jobs. If they were working prior to the recession their price of time could not have been higher than the relevant market wage rate after taxes.

EMPIRICAL EVIDENCE ON THE PRICE OF HOME TIME

The estimation of the price of home time for those who reduce their hours, become unemployed, or leave the labor force during a cyclical recession requires knowledge of the intercept and slope of the appropriate after-tax labor supply curve, which can be read from right to left as a demand

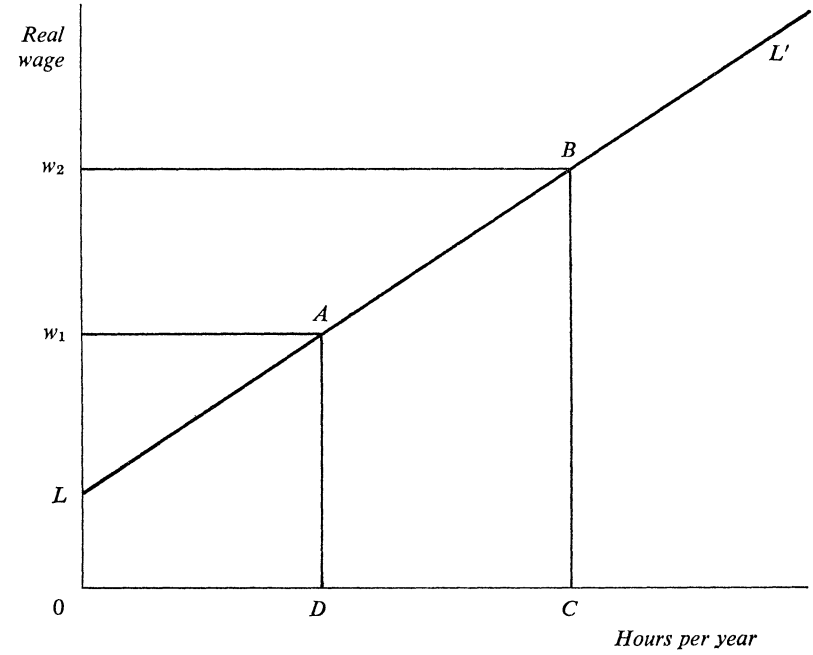
39. An analysis of this problem is contained in Reuben Gronau, "The Wage Rates of Women: A Selectivity Bias," working paper (National Bureau of Economic Research, September 1972; processed).

curve for home time, as depicted in Figure 2 by the schedule LL'. First, however, a troublesome difficulty must be resolved. Imagine that the curve LL' has been estimated from a cross-section consisting of two observations, at A and B. There are two quite different interpretations of this aggregate schedule:

(1) The individuals are identical and each has a supply curve LL'. Then the value of home time is $LADO$ for the first and $LBCO$ for the second. The average price of home time for an individual who leaves the labor force in a recession is thus halfway between his net wage (w_1 or w_2) and the intercept of the supply curve (OL). The triangles w_1AL and w_2BL are the lost rent on inframarginal hours due to labor market departure.

(2) The individuals are different, each having a horizontal supply curve —w_1A and w_2B respectively—which intersects the two labor demand schedules at A and B, respectively. In this case the average price of home time is the net wage (w_1 or w_2).

Figure 2. The Price of Home Time for the Unemployed or Partially Employed[a]



[a] See discussion in text.

Since, as far as I know, labor economists have provided no evidence on which of these interpretations is correct, I will assume that the truth lies halfway between the two. Thus the average price of home time will be taken as the intercept of the supply curve plus 75 percent of the difference between the net wage and the intercept. The net wage is the estimated acceptance wage adjusted for taxes and working costs.

Since the labor supply behavior of adult men, adult women, and teenagers differs in character, evidence on each group will be evaluated separately.

Married women. For married women with no access to welfare payments, the price of home time at the *margin*, after adjustment for search costs, taxes, and commuting expense, is estimated at approximately $1.85 per hour in 1971.[40] Innumerable previous studies have estimated the labor supply curve, and a complete survey of them is beyond the scope of this paper. Some recent estimates are presented in the first section of Table 2. Despite other differences, the elasticity of hours with respect to changes in the wage rate appears to fall in a relatively narrow range, between 0.66 and 0.95. The estimates of the intercept along the zero hours axis differs substantially, ranging between −$0.68 per hour and $0.79 per hour. This dispersion should be expected, since the samples in these studies contain few observations near the axes, and there is no reason to expect a uniformly linear relationship.[41] Because the final results are not sensitive to the choice of intercept, I chose the origin. By this compromise technique, then, the price of home time for women is 75 percent of $1.85, or $1.39.

Adult men. The evidence in section 2 of Table 2 suggests that the labor

40. The pretax hourly wage is taken as the 1960 "average potential wage" from Reuben Gronau, "The Effect of Children on the Housewife's Value of Time," *Journal of Political Economy*, Vol. 81 (March/April 1973, Pt. 2), p. S199. Then this wage rate is assumed to grow during 1960–71 at the same rate as average hourly earnings in the U.S. private economy, from *Economic Report, 1973*, Table C-30. A fringe-benefit adjustment is computed as the ratio of compensation of employees to wages and salaries, from *Economic Report*, Table C-15. This is converted into an acceptance wage by multiplying by 0.806, the Sheppard-Belitsky ratio of the acceptance wage to the previous wage for adult women (from Table 1), and then adjusted for a 37.7 percent deduction (as above in the computation of w_U) to reflect working costs and taxes.

41. Hall presents results for nonlinear supply curves, but on his curves for married women with children the closest points to the axes lie at about $1.00 per hour and 300 hours per year. Robert E. Hall, "Wages, Income and Hours of Work in the U.S. Labor Force," in Glen G. Cain and Harold W. Watts (eds.), *Labor Supply and Income Maintenance* (forthcoming).

Table 2. Selected Evidence from Studies of Labor Supply Behavior[a]

Units of w = \$1,000; units of H = hours per year

Study (1)	Year and data source (2)	Group covered (3)	Hourly wage intercept at $H = 0$ (4)	Uncompensated response of H_i: Elasticity w_i (5)	Elasticity w_j (6)	Slope dH_i/dw_i (7)	Slope dH_i/dw_j (8)
1. *Adult women*							
a. Ashenfelter-Heckman (I)	1960 U.S. Census	All adult women	−0.68	0.874	−1.204	186	−148
b. Heckman	1967 National Longitudinal Survey	White wives, 30–44	0.79	0.66	n.a.	649	n.a.
c. Leibowitz	1960 U.S. Census	Women over 14	−0.26	0.946	n.a.	202	n.a.
2. *Adult men*							
a. Ashenfelter-Heckman (I)	1960 U.S. Census	Adult men	...	0.003	0.030	18	1[b]
b. Ashenfelter-Heckman (II)	1967 Survey of Economic Opportunity	Spouse present but not working	...	−0.15	n.a.	−38	n.a.
c. Hall	1967 Survey of Economic Opportunity	White husbands, 20–59	...	n.a.	n.a.	−78[b]	n.a.

Sources: See Appendix B.

a. H = hours of work
w = real wage
i = one family member
w_j = real market wage of other family member
d = derivative.

b. Coefficient is statistically insignificant.

n.a. Not listed in source.

supply curve for adult men is essentially vertical with a slight backward bend. Evidence based on the 1967 Survey of Economic Opportunity, with a sample skewed toward low-wage individuals, indicates that white men work approximately 2,000 hours per year even at an hourly wage rate of \$1.00.[42] Thus the average value of leisure time during the working day for an unemployed adult male is probably less than \$1.00 per hour.

Despite the fact that unemployed men do not spend much time searching for work after their first month of unemployment, the analytical framework of the earlier unemployment model applies to the portion of unemployment devoted to "waiting." The marginal cost per week of remaining unemployed, as opposed to taking a job at the acceptance wage, is the after-tax acceptance wage minus unemployment benefits, and is equally applicable whether the individual actually goes out to search or waits at home. Searching or waiting is rational whenever the expected returns from not taking a

42. Hall, "Wages, Income and Hours of Work." Hall's wage rates are adjusted for federal income tax but neither social security nor state income taxes.

job at the acceptance wage outweigh the costs. The estimated price of unemployed time (w_U) sets an upper limit on the value of home time during unemployment, since otherwise the returns from taking a job at the acceptance wage, net of taxes and forgone unemployment benefits, would be smaller than the returns from staying at home.

The earlier estimate of the price of search time applied to all unemployed individuals. For all employed males in 1971 average gross weekly compensation was $180.94.[43] Converted to an after-tax acceptance wage for the unemployed, this is reduced to the much lower figure of $75.87 per week.[44] On the assumption that all adult males are eligible for unemployment compensation at the average 1971 rate of $54.59 per week, the marginal weekly cost of search time becomes $21.28, or about the same as the average for all individuals. Divided into a forty-hour week, this comes to an hourly cost of $0.53. This figure is applicable only to the period before unemployment benefits are exhausted, but this qualification would cover most of those who become unemployed in moderate recessions.

The low imputed value of home time of the unemployed, at a rate of only $0.53 per hour, may prove surprising. But if reasonably correct, it implies that in this respect the situation of the adult unemployed male today is not very different from that of the subjects of Bakke's depression case studies, who reported, "My time has no value." The crucial difference between them is not in the effect of unemployment on the value of the husband's time during normal working hours, but in the effect of unemployment on the value of the wife's time and on the husband's time during normal leisure hours. When the consumption of goods declines drastically, as in the depression, the marginal product of all home time declines. Mealtime is less pleasant when beans are on the plate instead of steak, and recreation time less enjoyable when it must be spent at home rather than at the

43. Annual earnings of employed male civilians in 1970 from U.S. Bureau of the Census, *Statistical Abstract of the United States, 1972* (1972), p. 328, are converted to 1971, using *Economic Report, 1973*, Table C-30, and adjusting for fringe benefits from Table C-15.

44. The earlier calculation cited a study that indicated that the wage on the last job for unemployed individuals in 1961 was 77.8 percent of the average for all employed individuals. Since roughly half of this difference is due to the different demographic composition of the employed and unemployed, I assume that the appropriate ratio for adult males is 0.90. The ratio of the acceptance wage to previous wage is taken from Table 1 above, for the Sheppard-Belitsky adult male sample (0.749). The adjustment for taxes assumes the same marginal rate and commuting cost as did the earlier computation of the overall price of search time.

movies.[45] In the postwar period, on the other hand, unemployment benefits, improved net asset positions, and (most important) a shorter duration of joblessness have cushioned the decline in the consumption of market goods during unemployment.[46] Another important change has been the shift in consumption to durables, which remain in the household and help to maintain the productivity of time even when income drops substantially.

Some may argue that $0.53 per hour is too high a value to impute to the home time of unemployed males, since nonpecuniary benefits flow from working in a society where work is the normal daytime activity of adult males.[47] A sample of 100 relatively low-paid blue-collar workers in a Cleveland electronics factory was asked whether they would require a government payment higher or lower than their present wage to stay at home instead of working. Seventy-five percent of the males responded that they would require a higher payment, 25 percent "the same," and nobody "less." For women the respective percentages were 56.5, 39.2, and 4.3.[48] This evidence of the nonpecuniary costs of staying at home is also consistent with the psychological studies of family tension caused by husbands who stayed at home and interfered with the family household routine during the Great Depression.[49] I find this argument rather persuasive and for the present purpose am inclined to set the value of home time for adult males at zero rather than at $0.53 per hour.

Teenagers. Since nationwide data on the acceptance wage of teenagers have been collected (see Table 1), I accept these estimates after correction for taxes, yielding a value of home time of $1.27 at the margin.[50] To main-

45. For detailed evidence on the shift of leisure time activities of the depression unemployed, see George A. Lundberg, Mirra Komarovsky, and Mary A. McInerny, *Leisure: A Suburban Study* (Columbia University Press, 1934), and National Recreation Association, "The Leisure Hours of 5,000 People: A Report of a Study of Leisure Time Activities and Desires" (New York: The Association, 1934; processed).

46. For detailed evidence on the relevant income elasticities of consumption, see Michael Grossman, "Unemployment and Consumption: Note," *American Economic Review*, Vol. 63 (March 1973), pp. 208–13.

47. I am sure that, like me, other work-at-home professors have had to answer inquisitive neighborhood children who ask, "Today's Wednesday—why aren't you at work, mister?"

48. The unpublished survey was taken by my student, T. George, at Cleveland Electronics, Inc., in February 1973.

49. Mirra Komarovsky, *The Unemployed Man and His Family: The Effect of Unemployment Upon the Status of the Man in Fifty-nine Families* (Dryden, 1940).

50. The Perrella study reported in Table 1 yields an average acceptance wage of $1.68 for men and $1.64 for women. The average of $1.66 is adjusted for taxes on the assump-

tain symmetry with the treatment of adult women a zero intercept of the labor supply curve is assumed for teenagers, and the *average* value of home time is estimated at 75 percent of $1.27, or $0.95.

All workers. When these estimates for men, women, and teenagers are weighted by the shares of each demographic group in 1971 unemployment, the implied average price of home time for all unemployed individuals is $0.70 per hour, or 42 percent of the previous wage ($61.20 per week). Multiplied by an average of 80 percent of unemployed time devoted to home time rather than search ($w_N(1 - s)$ in equation A-2), this makes the value of home time 33.8 percent of the previous wage. This is very near the estimate arrived at in the discussion of the table in Appendix A, in which the marginal revenue of job refusal is analyzed.

Summary of Effects for the Temporary Case

The implications of the previous estimates are illustrated in Table 3 for a reduction of 1 percentage point in the unemployment rate from the 5.9 percent average of 1971. The first three lines summarize the "traditional" Okun's law approach, which separates the increase in output into four parts. The first three parts are the increases in manhours due to lower unemployment, entry into the labor force, and higher hours per employee. The price at which higher manhours are evaluated differs for each source: Labor force entrants have the lowest productivity since they consist almost entirely of teenagers and adult women. Next is the unemployed group, containing a higher fraction of adult men than the labor force entrants. The highest price is imputed to the increase in hours. Here the price used in Table 3 (line 1c) is private output per manhour, which probably understates the value of increased hours because they tend to be concentrated in durable manufacturing.

Line 2 represents the increase in private productivity that characteristically occurs along with the reduction in unemployment. The specific quantitative effects in lines 1 and 2 are based on Perry's estimates[51]—a 1

tion that teenagers pay social security tax, half the personal income tax rate paid by adults in the previous examples (because many teenagers earn so little over the year that their income tax is either entirely exempt or taxed at a low average rate), and no state income tax. Commuting expense of $0.15 an hour is assumed.

51. Perry, "Labor Force Structure."

Table 3. Welfare Effect of a Temporary Decline of 1 Percentage Point in the Unemployment Rate, 1971 Population and Productivity Levels

Item in calculation	*Manhours (billions)* (*1*)	*Price per manhour (dollars)* (*2*)	*Total value (billions of dollars)*[a] (*3*)
1. Increase in manhours, qdM			
a. Lower unemployment	1.618	5.40	8.74
b. Entrance to labor force	1.058	4.58	4.85
c. Higher hours	0.623	7.82	4.87
2. Increase in productivity, Mdq	117.700	0.08	9.90
3. Total gain in market GNP	...	...	28.36
4. Reduction in search time by unemployed, $w_U sdU$	−0.367	0.57	−0.21
5. Reduction in home time, $w_N dN + w_U(1 - s)dU$			
a. Less "waiting time" by unemployed	−1.260	0.57	−0.72
b. Entrance to labor force	−1.058	1.01	−1.07
c. Higher market hours	−0.623	2.88	−1.79
6. Total change in output of "final commodities"	...	...	24.57

Sources: See Appendix B.
a Column (1) times column (2), except line 2, which is explained in Appendix B.

percent reduction in unemployment is associated with a 2.7 percent increase in GNP, or $28.36 billion in 1971, of which about two-thirds represents the extra manhours input and the remainder higher productivity.

Lines 4 and 5 in Table 3 evaluate the effects of lower unemployment on the quantity of unemployed time and home time. The value of the increased market activity is already included in line 1; lines 4 and 5 deduct that portion of the increased value of market hours that is offset by the reduced value of hours devoted to search time and home time. The effect of lower unemployment is split into two parts; line 4 measures the value of hours that shift from search, and line 5a the time the unemployed spend "waiting" at home. The shift in hours caused by labor force entry, reported in lines 5b and 5c, is exactly the same as is reported in lines 1b and 1c, but it is evaluated at a much lower price. Market activity yields a marginal product higher than the value of time at home because each extra market hour raises (a) the rent on inframarginal hours, (b) the income of capital, and (c) the income of government both through taxes on labor and taxes on capital.

The net effect of all this is that the crude calculations of the absolute cost of the recent recession quoted at the beginning of this paper survive nearly intact from the "broader view." The Okun's law elasticity, defined as the absolute change in final commodities divided by the level of market output (dZ/Q), is reduced merely from 2.7 for the naive case that evaluates nonmarket activity at a zero price, to 2.3 when an appropriate price is applied to nonmarket activity. However, to maintain symmetry with the rest of the analysis, the elasticity should be redefined as the absolute change in final commodities divided by the level of final commodity production:

$$\frac{dZ}{Z} = \frac{dZ}{Q}\frac{Q}{Z}. \tag{17}$$

Since Q/Z is about 0.45, the augmented elasticity with respect to the employment rate is about 1.0.[52]

The Permanent Case

The evidence summarized in Table 3 indicates that a 1 percentage point reduction in the unemployment rate yields a net increase in output of final commodities of over $24 billion. But part of this large difference in output is transitory; it may be considerably smaller in the long run, for two states of the economy that differ permanently by 1 percentage point in their unemployment rates. In fact there may be some positive unemployment rate that is "optimal" in the sense that maintaining a permanently lower unemployment rate results in a loss in net output—considering the loss in the value of nonmarket activity—rather than a gain. The concept of an "optimum" unemployment rate, as used here, considers only the direct effects on welfare of changes in unemployment and abstracts from the welfare cost of the extra inflation indirectly caused by lower unemployment. The optimum unemployment rate may be lower than the "natural" unemploy-

52. The estimation of Z raises complex questions that are beyond the scope of this paper. My simple assumptions are that each member of the population above 16 years of age has 5,096 total hours available per year for market and nonmarket production (allowing 10 hours per day for sleep and personal care). This yields a total of 726.7 billion manhours, of which 157.8 billion are devoted to market and 568.9 billion to nonmarket activity. As a rough guess (let us not debate how to value after-work and weekend hours), I assume a value of w_N equal to one-third of GNP per market manhour ($6.67 times 0.33 equals $2.20). Thus Z is GNP ($1,050 billion) plus $w_N N$ ($1,263 billion), or $2,313 billion.

ment rate below which inflation continuously accelerates, and hence may not be permanently sustainable.

The major purposes of this section are to amend Table 3 for any differences between the temporary and permanent cases and to indicate roughly where the optimum unemployment rate might lie. The first subsection below amends the estimate of labor input for the permanent case, and the second attempts the more difficult tasks of estimating the permanent productivity of that extra labor input and the change in overall productivity that may be brought about by a permanent reduction in the unemployment rate.

CHANGES IN LABOR INPUT

Reduction in unemployment. Since the numeraire in both the temporary and permanent cases is a 1 percentage point reduction in the unemployment rate, the extra manhours of employment caused by a reduction in unemployment of this size are identical in Table 3 for the temporary case and Table 4 for the permanent case.

Entrance to the labor force. The response of labor force participation to changes in the unemployment rate may be either larger or smaller in the long run than it is in the short run. A greater long-run response may occur if discouraged workers leave the labor force gradually after experiencing unemployment. A regression of labor force participation on the current unemployment rate alone (as in the regressions of Perry on which line 1b of Table 3 is based) indicates only the instantaneous response of participation to a change in unemployment and may understate the long-run response. A regression of participation on both the current unemployment rate and a long series of past unemployment rates yields a mean lag in response of 10.5 quarters.[53] The total long-run response of the labor force

53. In the fitted regression the dependent variable is "disguised unemployment" (U^D), the deviation of the secondary labor force participation rate from its trend, and the independent variable is the official unemployment rate (U):

$$U^D = \underset{(-10.5)}{-0.043} + \underset{(11.9)}{0.995U_L}.$$

$R^2 = 0.836$; standard error of estimate = 0.00337; sample period = 1954:1–1972:2.

The subscript L on the independent variable indicates its coefficient is the sum of a series of twenty-eight distributed lag coefficients estimated by the polynomial distributed lag technique, with a fifth-degree polynomial constrained to have a zero endpoint. Details on the construction of U^D are contained in my "Inflation in Recession and Recovery," Appendix C.

Table 4. Welfare Effect of a Permanent Decline from 5 Percent to 4 Percent in the Unemployment Rate, 1971 Population and Productivity Levels

Item in calculation	*Manhours (billions)* (1)	*Price per manhour (dollars)* (2)	*Total value (billions of dollars)*[a] (3)
1. Increase in manhours, qdM			
a. Lower unemployment	1.618	4.90	7.93
b. Entrance to labor force	1.619	4.59	7.43
c. Higher hours	0.330	5.84	1.93
2. Change in productivity, Mdq	117.700	−0.05	−5.80
3. Total gain in market GNP	...	...	11.49
4. Reduction in search time by unemployed, $w_U sdU$	−0.367	0.57	−0.21
5. Reduction in home time, $w_N d_N + w_U(1 - s)dU$			
a. Less "waiting time" by unemployed	−1.260	0.57	−0.72
b. Entrance to labor force	−1.619	1.01	−1.64
c. Higher market hours	−0.330	2.88	−0.95
6. Total change in output of "final commodities"	...	...	7.97

Sources: Column (1), lines 1a, 2–5a, column (2), lines 4–5c, and column (3), lines 4 and 5a, are same as Table 3. Sources for the other lines are explained in the text.

a. Column (1) times column (2) except line 2, which is explained in the text.

participation rate to a 1 percentage point change in the unemployment rate is 0.995 percent, in contrast with the 0.400 percent that is estimated to occur within the first two years.[54] Line 1b of Table 4 reflects the full long-run effect of lower unemployment on labor force participation from my time series regression.

Higher hours. Variations in hours act as a buffer to allow firms to adjust labor input for temporary changes in demand without incurring the substantial costs of hiring, training, and separation involved in varying the number of employees. Hours would be expected to respond less sensitively to a permanent reduction in the unemployment rate than to a temporary reduction, since firms that expect the higher output level to persist will be

54. Perry's coefficients used in line 1b, Table 4, have a total response in the labor force participation rate of 0.65 percent. Translated into percentage *point* changes in the labor force participation rate, my long-run response is 0.61 point—from 60.39 to 61.0—and Perry's is 0.40 point.

willing to hire and train additional workers in order to eliminate high-cost overtime hours. But the response of hours to lower unemployment does not necessarily disappear in the permanent case, because unexpected vacancies will still occur as a consequence of random shifts in the demand for particular products. Firms will find these vacancies harder to fill in a low-unemployment economy and as a result will be forced to rely on overtime hours to a greater extent than in a high-unemployment economy. In a regression of hours per man on employment conditions, the long-run response appears to be about 53 percent of the response within the first year, and so line 1c of Table 4 is set at 53 percent of the same line in Table 3.[55]

PRODUCTIVITY EFFECTS

The value of product contributed by the extra labor input in lines 1a, 1b, and 1c of Table 4 cannot be measured without an estimate of the overall productivity effect in line 2. The previous discussion of the temporary case in Table 3 assumes that the output contribution of each additional worker who shifts from unemployment or who moves into the labor force is equal to the *average* product of all individuals in his demographic group. If these newly employed persons win jobs producing an output greater than average, the effect of upgrading is treated in Table 3 as a consequence of productivity change rather than higher labor input. This allocation is arbitrary, and has no effect on the total change in output because productivity change there is a residual calculated after subtraction of the contribution of labor input from a statistical estimate of the increase in market output (line 3). In the present discussion of the permanent case, however, no evi-

55. In the fitted regression the dependent variable is "the unemployment of hours" (U^H, the deviation of hours per man in the nonfarm labor force from its trend) and the independent variable is the gap (G) between actual and potential GNP:

$$U^H = \underset{(5.3)}{0.0058} + \underset{(3.6)}{0.1152 G_L}.$$

$R^2 = 0.755$; standard error of estimate = 0.00361; sample period = 1954:1–1972:2.

The subscript L on the independent variable indicates its coefficient is the sum of a series of ten distributed lag coefficients estimated by the polynomial distributed lag technique, with a third-degree polynomial constrained to have a zero end-point. Details on the construction of U^H are contained in my "Inflation in Recession and Recovery," Appendix C. The sum of coefficients in this regression is 0.2155 after four quarters and 0.1152 after ten quarters. Longer lags did not improve the fit.

dence exists on the total output response from which to compute a productivity residual, and hence the productivity effect must be measured directly.

This section assumes that the effects of added labor input are limited to the nonfarm private business sector (NPBS) and that labor input and productivity are fixed in the government, farm, and (market) household sectors. Within the NPBS the major long-run effect of increased labor input is to increase the scale of operations. With a constant-returns production function, the average productivity of labor is a function of the *ratio* of labor to capital and other factors, but not of the scale of operations. A lower unemployment rate stimulates investment until the capital stock is raised sufficiently to equip the new workers with the same capital-labor ratio as those working previously. Since the age structure of the population does not change, there is no reason to expect a change in the average wealth-income ratio, and without a shift in the production function no change will occur in the capital-output ratio. Thus both the real wage and real interest rate are unaffected. The extra plants will be neither more nor less productive than the average, since in the long run the average age of capital is a function only of the depreciation rate and the growth rate of the economy, not of its overall scale.

Since the higher capital stock must be maintained by larger depreciation deductions and returns to owners of capital, a portion of the increase in output produced by the added labor input is unavailable for consumption (if output and capital are to be maintained permanently at their higher levels), and hence is not a net social benefit. This contrasts with the temporary case in which the capital stock is fixed, depreciation is assumed to be fixed, and all of the increase in output is available for consumption. Since income to capital in 1971 was 25.9 percent of NPBS output, only the remaining 74.1 percent is available for private and government consumption on the assumption that the real rate of return is the same on the extra capital as on the preexisting capital.[56]

This straightforward conclusion that the average product of labor in the NPBS is insensitive to the unemployment rate in the long run implicitly assumes that all workers and jobs are identical and thus ignores the possibility of upgrading when the unemployment rate is reduced. Also ignored

56. Capital income includes capital consumption allowances, corporate profits after tax, and after-tax interest, rent, and income of nonfarm properties.

is the possible inefficiency of a high-pressure economy in reducing the "spare tire of the unemployed" upon whom employers can call when they have an unexpected increase in labor demand. These modifications are considered next.

Upgrading. In his paper in this volume Okun estimates that when the unemployment rate declines from 5 to 4 percent the average wage paid on the extra jobs (45 percent of which are in durable manufacturing) is much higher than the average wage received by those demographic groups (teenagers and adult women) contributing most of the extra labor input. Each extra job pays on average 16 percent above the national average for all wage and salary workers, but the average wage that each worker would receive if he were paid the average for his demographic group is 22 percent *below* the national average.[57]

If accepted at face value, Okun's estimates imply that the value of marginal product attached to the extra manhours of labor input in Table 4 should be 16 percent above the national average. But this exaggerates the benefit of a permanent reduction in the unemployment rate for two important reasons. First, the increased share of high-wage durable manufacturing is a temporary cyclical phenomenon that will not last forever. Because the demand for producer and consumer durables behaves according to an accelerator mechanism, the production of durables is always relatively high when the economy is expanding relatively rapidly. But in the long run, when the economy is growing steadily at its potential rate of growth and the capital stock of consumer and producer durables has adjusted to the larger size of the market sector, the share of durables in output and employment should return to its "normal" (trend) level. The industrial composition of output in the long run should be insensitive to a permanent change in the unemployment rate.[58]

Second, the average wage paid to a newly hired employee in durable manufacturing is lower than the average wage received by all employees in that sector. Low seniority, short previous experience, and subaverage ability all suggest low relative wages for the unemployed, as is confirmed by the result that in 1961 the unemployed earned 26 percent *less* on their

57. Arthur M. Okun, pp. 223, 224, this volume.

58. This is not strictly correct, since a lower unemployment rate generates higher market income, and the income elasticity of demand for each sector is not identical. However, long-run income elasticities are not the same as the short-run elasticities that Okun considers and may be higher for services than for durable goods.

last job than the average for all employees.[59] Okun's approach allows for this, since the newly hired employees can push the former occupants of their jobs upward in the wage structure. But even assuming that the distribution of employees across the wage structure is insensitive in the long run to a change in the unemployment rate, the extra training required by the newly hired and newly promoted workers surely imposes a cost on society that Okun's approach ignores.

The analogy with capital equipment is instructive. Lower unemployment raises labor input, and each new worker will be equipped in the long run with the same capital-labor ratio as incumbent workers. But the after-tax return to capital required to finance the extra equipment must be subtracted from the average product of the new workers available for private or government consumption. In the same way, each new worker will either be less productive than those already working or will be equipped in the long run with sufficient human capital in the form of on-the-job training to become identical to them. In the latter case an estimate of the social cost of upgrading is required. Since employers did not previously choose freely to hire secondary workers, two possible interpretations of the cost of upgrading are available:

(a) Secondary workers were not previously hired, despite the lower wages at which they were available, because the cost of training and upgrading, and the cost of shorter job tenure expected of teenagers and adult women (which reduces the period of payoff from firms' training investment), exceeded the present value of the expected profits to be made from the output produced by these workers.

(b) Secondary workers were not previously hired because employers irrationally discriminated aginst them and did not know a good bargain when they saw one.

The first interpretation implies that the extra wages that new workers receive from the upgrading process provide no net benefit to the private sector, because they are balanced by the cost of training and short tenure. The second interpretation implies that some or most of the extra wages represents a net benefit. Under *both* interpretations, all the taxes paid on the extra product, both by the firm and by the employee, yield a net social benefit.

A growing body of research on the relationship between work experience

59. Stein, "Work History, Attitudes, and Income of the Unemployed," p. 1410.

and earnings indicates that a major cause of the earnings gap between men and women is the interruption of work experience of women for spells out of the labor force. First, the skills women acquire depreciate faster when they leave the labor force, imposing a deadweight loss on society through a reduction in the female labor force participation rate. Second, in leaving the labor force women also lose the opportunity to acquire *further* experience. Since Polachek has estimated that roughly 50 percent of the male-female earnings differential can be explained by the two factors together, a permanent increase in the labor force participation rate tends to make women more like men and reduces the training expense necessary to upgrade them into male jobs.[60] To reflect this finding I set the average product of manhours permanently shifted into employment in Table 4, lines 1a and 1b, at a value midway between the average product based on demographic weights used in Table 3 and the average product of all employees. For higher hours (line 1c) the average product of all employees is used.[61]

The "spare tire" theory. From an initial situation in which job vacancies are equal to unemployment, what are the consequences of an increase in aggregate demand sufficient to lower the unemployment rate by 1 percentage point—for example, from 5 percent to 4 percent?[62] The number of job vacancies will be larger than previously, the number of applications from the unemployed per vacancy will decline, the duration of each vacancy will increase, and each job slot will suffer an increased average number of

60. Solomon W. Polachek, "A Comparison of Male and Female Post-School Investment Behavior and Earnings Using the 1967 Longitudinal Survey of Work Experience of Women 30–44 Years of Age" (unpublished working paper based on his Ph.D. thesis, Columbia University, 1973; processed).

61. These values are then reduced, in comparison to Table 3, for the deduction of the 25.9 percent required to service additional capital input. Polachek's results serve as a reminder not to go further and attribute the average product of all employees to the marginal labor force entrants. He finds that married female employees who worked in 1966 but had quit or been laid off later in the year had a 12 percent lower wage, all other things held equal, than females who worked the entire year. "This result substantiates the hypothesis that those with smaller amounts of human capital have a higher tendency to leave the labor force" (p. 8).

62. There is no reason for the point at which vacancies are equal to unemployment to signify balance of labor supply and demand. Part of the available labor supply consists of individuals who have declared their intention to quit but are still employed while they search for a new job; some job seekers may search informally while still officially defined as not in the labor force; further, many new jobs are filled without an employer ever formally declaring a "vacancy." The optimum relationship between vacancies and unemployment depends on the costs and benefits associated with each.

"vacancy spells." To what extent is the efficiency of the economy reduced by higher vacancies?[63]

The answer requires estimates of the response in the number of vacancies to the lower number of unemployed, and the effect on efficiency of each extra vacancy. While no comprehensive job vacancy data are available for the United States, evidence from the United Kingdom suggests that the vacancy-unemployment relationship conforms reasonably well to a rectangular hyperbola:

$$UV = U^{*2}, \tag{18}$$

where U is unemployment, V is total vacancies, and U^* is the level of unemployment at which vacancies and unemployment are equal.[64] As the unemployment rate declines by successive steps, the increase in the vacancy rate associated with each step grows larger. An expansion of labor demand in slack markets mainly soaks up unemployment without resulting in vacancies, whereas in very tight markets it raises vacancies but has little effect on rock-bottom unemployment.

The effect on efficiency of a permanent increase in vacancies depends crucially on how accurately labor requirements can be predicted in advance. Many job openings occur with ample forewarning; examples include employees needed to staff a new shopping center or factory scheduled to open on a particular future date, and new hires needed to replace employees who voluntarily quit with advance notice or those who quit without notice but according to an average, predictable, quit rate. In these cases personnel offices simply advertise their vacant job slots earlier and more often in response to lower unemployment, and the social cost of extra advertising must be relatively small compared with the $17.3 billion gain of lower unemployment listed in section 1 of Table 4.

The more interesting case is when vacancies cannot be foreseen, either because of stochastic product demand or because of stochastic quits without notice. Firms requiring additional employees must operate longer than they wish with unfilled vacancies, at the cost of lower profits, extra effort

63. My interest in the "spare tire" theory was stimulated by Hall's discussion in his "Turnover in the Labor Force."

64. See J. C. R. Dow and L. A. Dicks-Mireaux, "The Excess Demand for Labour: A Study of Conditions in Great Britain, 1946–56," *Oxford Economic Papers*, Vol. 10 (February 1958), pp. 1–33. The assumption of a rectangular hyperbola was made by these authors in the calculation of an index of excess labor demand (p. 22), and seems consistent with their plot of the vacancy and unemployment series for 1951–56 (p. 4).

by employees for which they may not be compensated, unfilled orders for purchasers of goods, and longer queues for purchasers of services. Since one additional employee hired at the margin will cause only a negligible increase in the firm's profits, the most important consequence of unanticipated vacancies is probably the increase in waiting times associated with additional unfilled orders and queues.

Unfortunately, no simple analysis can provide a quantitative estimate of the "spare tire" effect on waiting times. Some unfilled orders may cause little inconvenience—for example, those for new trucks that replace old ones with the same capacity. Others—for, say, a replacement part for a crucial machine—may cause an entire assembly line to be shut down if they remain unfilled. In the case of consumer queues, the outcome depends on the importance of congestion phenomena and the ability of supervisory personnel to fill vacant slots during rush hours without neglecting other important duties. It is easy to construct examples in which one vacant slot causes an increase in consumer waiting times worth ten to twenty times the wage at which the vacancy is offered.[65] For the purposes of the calculations a parameter (g) is defined as the ratio of the social cost of a vacancy to the average market product of the job slot when filled (q^*). If the proportion of vacancies that cannot be accurately foreseen is a, the social cost imposed by additional unfilled vacancies is agq^*dV. The social benefit produced by a reduction in unemployment is $-q^*(1 - k)dU$, where k is the fraction of the extra output required to service higher capital input. The role of k is asymmetric, since an unforeseen vacancy does not reduce capital requirements; the job slot would not exist without the capital to go with it.[66] A

65. Consider a three-hour rush period in a supermarket between 4 p.m. and 7 p.m. when 650 customers arrive. Normally ten checkout lanes are operated, with a capacity of 20 customers per hour, for a total capacity of 600 customers in these hours. Fifty customers are not processed at 7 p.m. and must wait 15 extra minutes (50 divided by capacity of 200 per hour). The average waiting time over the three-hour period is approximately half of 15 minutes, or 7.5 minutes. Now eliminate one checkout stand because a vacancy is unfilled. Capacity between 4 p.m. and 7 p.m. is reduced to 540, so that after 7 p.m. 110 wait an average of 37 extra minutes (110/180 capacity = 0.61 hour). The average waiting time over the three-hour period is approximately half of 37 minutes, or 18.5 minutes. Thus the extra waiting time caused by one vacancy is 11 minutes (0.183 hour) times 650 customers, or 119 hours worth $179 at $1.50 per hour (the figure used earlier for the value of time spent in commuting). This amount is about eighteen times the wage that a part-time employee would have been paid for a three-hour shift.

66. For instance, in the supermarket example in the previous footnote, one extra vacancy implies that a cash register and checkout lane are standing idle.

consequence of lower unemployment is waste when capital equipment is underutilized due to a shortage of available labor. The *net* social benefit (B) of lower unemployment is

$$B = -\left(1 - k + ag\frac{dV}{dU}\right)q^*dU. \tag{19}$$

Since, from (18), $dV/dU = -(U^*/U)^2$, equation (19) can be rewritten as

$$B = -\left[1 - k - ag\left(\frac{U^*}{U}\right)^2\right]q^*dU. \tag{20}$$

The optimum unemployment rate (U'), at which net social benefit is zero, can be written (ignoring the other components of Table 4) as

$$U' = U^*\sqrt{\frac{ag}{1-k}}. \tag{21}$$

Unemployment is optimum at U^* (where vacancies equal unemployment) if one fewer unemployed person would create output $(1 - k)q^*$ just sufficient to balance the inefficiency cost of one additional vacancy (agq^*). If all vacancies are foreseen ($a = 0$), or if the social cost per unforeseen vacancy is zero ($g = 0$), then the optimum unemployment rate is zero.

The net effect on productivity. The summary evaluation in Table 4 requires a numerical estimate of the percentage of job vacancies that cannot be foreseen (a), the social cost per unforeseen vacancy (gq^*), and the unemployment rate at which vacancies equal unemployment (U^*). I have made some guesses about plausible values of these parameters, but readers who have differing intuitions are invited to substitute their own estimates. My inclination is to treat most vacancies as predictable and thus guess a rather low value of a, for example, 0.25. As for g, the supermarket example (note 65) and my own experience as a consumer suggest that the social cost of waiting time per vacancy may be substantially higher than its potential average market product in the service industries, whereas the social cost of manufacturing vacancies may be much less. As a compromise, I select $g = 1$, so that the social cost of a vacancy is equal to the wage of the job when it is filled. In this case, the product ag is 0.25. Those who prefer estimates of $a = 0.5$ and $g = 0.5$ would also accept this value for ag. In the region of 4 to 5 percent unemployment, where vacancies are probably roughly equal to unemployment, this estimate of ag implies that each dollar of extra product added by a reduction in the unemployment rate creates an external diseconomy equal to $ag/(1 - k)$, or \$0.33, through the inefficiency of added vacancies. Thus in Table 4, line 2 of column (3) is

entered minus 33 percent of the additional product registered in line 1 of column (3).

The assumptions that $ag = 0.25$ and that vacancies equal unemployment at approximately a 4½ percent unemployment rate ($U^* = 0.045$) imply, according to (21), that the optimum unemployment rate is 2.6 percent. Readers who prefer higher or lower values of the unknown variables (U^* and ag) are free to substitute them.

PERMANENT CASE: CONCLUSION

The bottom portion of Table 4 is similar to Table 3 and applies the same prices of nonmarket activity to compute the social cost of reduced nonmarket activity when increased aggregate demand shifts some individuals from unemployment to employment and draws others not previously in the labor force into jobs. The net result is to reduce the effect on full income of a permanent reduction in the aggregate unemployment rate to only $7.97 billion, or only 0.76 percent of 1971 GNP. Because the response of vacancies to reduced unemployment is nonlinear, this permanent output response is very sensitive to the unemployment range where the 1 percentage point reduction applies, as indicated in Table 5. In that table, the net value of a permanent drop of 1 point in unemployment is shown starting at alternative unemployment rates. The optimum unemployment rate when the value of nonmarket activity is taken into account is 2.9 percent (from that starting point the positive contribution of a marginal reduction in the unemployment rate on line 3 of Table 4 just balances the negative elements on lines 4 and 5).

Table 5. Total Response of Final Commodity Production to a Permanent Reduction of 1 Percentage Point in the Unemployment Rate[a]

Initial unemployment rate (percent)	*Production response*	
	Value (billions of dollars)	*Percentage of 1971 GNP*
3.0	−5.70	−0.54
4.0	4.06	0.39
5.0	7.98	0.76
6.0	9.95	0.95
7.0	10.99	1.05
8.0	11.74	1.12

Source: Estimated by author. See discussion in text.

a. Assumes $V = U$ at $U^* = 4.5$, where V is total job vacancies, U is unemployment, and U^* is the level of unemployment at which vacancies and unemployment are equal.

These considerations imply that the crude Okun's law approach exaggerates the benefit of lower unemployment to a much greater extent in the long run than in the short run. While these estimates are obviously subject to many possible sources of error, the two most important may be the treatment of upgrading and the spare tire theory. Those who feel my treatment of these effects understates the decline in productivity associated with lower unemployment in the permanent case—because, for example, of larger social benefits from upgrading or smaller estimates of U^* or ag—may conclude that the difference between the temporary and permanent cases is not as great as indicated in comparing Tables 3 and 4. Others may conclude the opposite.

Another qualification is that the quantitative estimates all ignore redistributive effects of the transfer of a dollar from one individual to another. Lower unemployment involves a redistribution among individuals in different income classes. In the temporary case its net impact is unclear, since both the poor unemployed and the rich owners of capital benefit from lower unemployment. In the permanent case the major beneficiaries are those relatively poor individuals who find jobs or are upgraded, whereas the cost is borne mainly by the average consumer, who is inconvenienced by shortages and queues. Thus those who value a dollar given to a poor person more highly than a dollar taken from an average person should consider this analysis as setting an upper bound on the optimum unemployment rate.

At this point my aim is not to propose a final answer but to identify the major areas on which discussion, controversy, and research should focus in the future. Based on the present analysis and the assumptions made about productivity in the permanent case, two basic conclusions emerge quite strongly from the analysis:

(1) The social cost of a *temporary* recession is very high, and previous crude estimates by the Okun's law technique—that, for example, the 1969–70 recession cost "$100 billion"—emerge almost intact after a detailed consideration of the offsetting value of nonmarket activity.

(2) The social cost of a *permanent* increase in the unemployment rate by 1 percentage point is greatly exaggerated by the Okun's law technique, by a factor of about three. There is still a welfare gain from such a permanent reduction in unemployment, but it is less than 0.7 percent of GNP and may be relatively small compared with the risks of very high or accelerating inflation at a low unemployment rate.

APPENDIX A

Job Refusal and the Search Process

IN THE TEXT, a model of job refusal and acceptance in the search process was outlined. In it, the unemployed individual considering a job offer balances the cost of refusal against the returns from refusal. The elements of the returns from refusal, which were only sketched there, are developed more formally in this appendix. The formal model is used first to derive several results concerning the search process and unemployment, and then to check some of the empirical findings presented in the text.

Equation (12) in the text is reproduced here for convenience as (A-1):

$$MC = (1 - h)y. \tag{A-1}$$

It indicates that the marginal cost of refusing a job offer at the acceptance wage (y) is the forgone income at that wage rate, net of taxes and earning costs (commuting, uniforms), which amount to a fraction (h) of the forgone income.

In considering a job offer, the unemployed individual balances the cost of refusal given by (A-1) against the marginal return of refusal, which consists of several elements. The list of elements used here is more general than that in the recent literature on "the economics of search" in that it allows for both searching and waiting during unemployment.

1. If a worker has been laid off from his previous job and estimates a probability, β, of being rehired at his old job at his previous wage rate, w_0, the present value of the extra future returns from being rehired compared with acceptance of a job offer at the acceptance wage, y, is

$$R_n(1 - h)\beta(w_0 - y),$$

where R_n is a discount factor.[1] If the probability β is positive, this return

1. The discount factor depends on the discount rate (r) and the expected tenure of the job, n:

$$R_n = \sum_{t=1}^{n} \left(\frac{1}{1 + r}\right)^t.$$

This definition of the discount factor assumes that the receipt of βw_0 when the job offer is refused begins one time interval later than the receipt of y, should the job offer be ac-

from rehire will be received whether or not the individual looks for a job. While rehiring is very common for those who have been laid off, β is zero for a substantial fraction of the unemployed who have just entered or reentered the labor force, who quit their previous jobs, or who were laid off without prospect of a recall, because, say, of unsatisfactory job performance or permanent closing of a plant.[2]

2. If he devotes his time to search, an unemployed individual faces a probability distribution of wage offers. Some offers will be below the minimum acceptance wage (y) and will not be accepted. The mean value of the acceptable offers (those above y) is x, so that if an acceptable offer is received, the extra wage per period expected from search, after taxes and earnings costs, is $(1 - h)(x - y)$. The probability that an acceptable offer will be received during the next period is α_s times $(1 - \beta)$, the probability that rehire will not occur. An increase in the fraction of unemployed time devoted to search (s) raises the probability (α) of receiving an offer.[3] Thus the present value of the returns to search is $R_n(1 - h)(1 - \beta)\alpha_s(x - y)$.

3. When a job offer is refused, many of the unemployed receive unemployment compensation (b) which is independent of the fraction of time devoted to search, as long as there is some minimum amount.

4. Search requires expenditures on goods and services—shoe leather, bus fares, and telephone calls—which are a positive function of the fraction of unemployed time devoted to search, c_s.

5. Finally, a decision not to search or to spend only a fraction (s) in search activity allows the consumption of home time, which is valued at $(1 - s)w_N$.

The "marginal revenue" for the next period implied by a decision to refuse a job offer is the sum of the five elements on this list:[4]

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cepted. This assumption understates the return from job refusal if, for example, rehire (with probability β) occurs in the middle of the search interval, where the interval to which β applies is the period between job offers if the unemployed individual were to search for a job. Since $w_0 > y$, this component of the return from job refusal is positive.

2. In 1971, 46.3 percent of the unemployed cited "lost last job" as the reason for unemployment (*Manpower Report of the President, 1972*, Table A-21). In the more prosperous period of 1969, the percentage was 35.9 (*Manpower Report, 1970*, Table A-19).

3. α_s' is positive and α_s'' is negative if there are diminishing returns to an increase in the fraction of time devoted to search.

4. Equations (A-1) and (A-2) are substantially elaborated versions of equation (12) in Dale T. Mortensen, "Job Search, the Duration of Unemployment, and the Phillips Curve," *American Economic Review*, Vol. 60 (December 1970), p. 851. They extend Mortensen's equation to consider finite job tenure, taxes, earning costs, layoffs, direct

$$\text{(A-2)}\quad MR = R_n(1-h)[\beta(w_0 - y) + (1-\beta)\alpha_s(x-y)] + b - c_s + w_N(1-s).$$

The minimum wage (y) required for an offer to be acceptable is set at the level that equates marginal cost in (A-1) with marginal revenue in (A-2). When this equality is solved for y,

$$\text{(A-3)}\quad y = \frac{R_n(1-h)[\beta w_0 + (1-\beta)\alpha_s x] + b - c_s + w_N(1-s)}{(1-h)\{1 + R_n[\beta + (1-\beta)\alpha_s]\}}.$$

If the acceptance wage is set too high, unemployment will continue too long as jobs are refused that yield a higher wage than the returns from continued search. If the acceptance wage is set too low, an offer will be accepted too early, and the opportunity to earn a higher income by waiting for a better job will be lost.

The price of unemployed time (w_U) required for the purpose of this paper is the return to society of job refusal, consisting of the return to the unemployed individual minus the unemployment benefits paid by the rest of society to the unemployed. The term w_U can thus be expressed as either marginal cost reduced by unemployment benefits, as it was in (13), or as marginal revenue reduced by unemployment benefits:

$$\text{(A-4)}\quad w_U = R_n(1-h)[\beta(w_0 - y) + (1-\beta)\alpha_s(x-y)] - c + w_N(1-s).$$

The minimum acceptable wage set by an unemployed individual defines his *private* opportunity cost in activities other than work; but his *social* opportunity cost is less than this by the amount of unemployment compensation, since his acceptance of a job confers on society an external benefit in the form of lower taxes to finance unemployment compensation. A possible "congestion" effect that further reduces the social relative to the private opportunity cost would occur if the decision to refuse a job reduces the probability of finding a job for others, but this is not taken into account here.

A number of interesting conclusions can be derived from (A-3) and (A-4). If the expected probability of rehire (β) is sufficiently high, it will be rational for the unemployed individual to abstain entirely from search and enjoy an income of $b + w_N$ while he waits for recall to his old job. No

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search costs, the division between searching and waiting, and the role of home time during waiting. I am extremely grateful to Mortensen for his suggestions on the treatment in (A-2) of several of these extensions.

search will be undertaken if its expected gains relative to waiting are negative:

$$R_n(1-h)(1-\beta)\alpha_s(x-y) - c_s - sw_N < 0. \tag{A-5}$$

The condition in (A-5) can be rearranged to state that no search will occur if the difference between the expected wage offer (x) and the acceptance wage (y) is insufficient to cover the cost of search and the forgone home time during search:

$$x - y < \frac{c_s + sw_N}{R_n(1-h)(1-\beta)\alpha_s}. \tag{A-6}$$

Any of the following tend to increase the likelihood that no search will occur: an increase in the price of home time (w_N), of the tax rate (h), of unemployment benefits (b), of direct search costs (c_s), and of the probability of recall (β)—or a reduction in the discount factor (R_n) or the expected wage in a new job (x).[5]

Similarly, from (A-3) a list can be constructed of changes that raise the acceptance wage: an increase in the tax rate or earnings costs (which raise the relative size of untaxed home time and unemployment compensation), in the price of home time, in unemployment benefits, in the probability of recall, in the probability of finding a new job, or in the mean wage expected on a new job. Presumably a recession reduces the last three items on this list and hence reduces the acceptance wage for any given duration of unemployment. If the after-tax acceptance wage of those who do not expect recall ($\beta = 0$) and who are ineligible for unemployment compensation ($b = 0$) drops below the price of home time (w_N), they will leave the labor force. This explains why, in cyclical recessions, adult women and teenagers tend to exit from the labor force to a much greater extent than adult men.

5. The conditions are obtained by substituting the expression for y from (A-3) into (A-6) and rearranging:

$$x < w_0\left(\frac{R\beta}{1+R\beta}\right) + b\left[\frac{1}{(1-h)(1+R\beta)}\right] + c\left[\frac{1}{\alpha R(1-h)(1-\beta)}\right] + w_N\left\{\frac{s + R[\alpha(1-\beta)+\beta s]}{\alpha R(1-h)(1-\beta)(1+R\beta)}\right\}.$$

Since w_0, b, c, and w_N are multiplied by positive terms, an increase in each will raise the likelihood of no search. The tax term (h) appears only in the denominator and has a straightforward effect. The effects of R, α, and β must be obtained by differentiation.

In the text, w_U was estimated from the marginal cost of job refusal given by equation (13). A cross-check can now be provided from a rough estimate of the marginal revenue of job refusal, calculated using (A-4):

$$\frac{w_U}{w_0(1-h)} = R_n\left[\frac{\beta(w_0 - y) + (1-\beta)\alpha(x-y)}{w_0}\right] + \frac{w_N(1-s) - c}{w_0(1-h)}. \tag{A-7}$$

Since it was estimated in the text that the left-hand side of (A-7), the ratio of the price of unemployed time to the after-tax previous wage, is equal to 0.342, the aim here is plausible values for the right-hand side that will satisfy the equality. Table A-1 provides estimates of all values but $w_N(1-s)$, the price of home time per month for those hours remaining after search is completed. This value must be \$54.76 to satisfy (A-7), or about 20.6 percent of the previous after-tax wage.

The least reliable estimates in Table A-1 are likely to be those for search

Table A-1. Values of the Components of Marginal Revenue from Job Refusal, as Derived from Equation (A-7)

Component of equation (A-7)	*Value*
1. Discount factor, R_n	10.6
2. Probability of rehire, β	0.122
3. Difference between previous wage (w_0) and acceptance wage (y), divided by previous wage, $(w_0 - y)/w_0$	0.172
4. Probability of finding job, α_s	0.295
5. Difference between expected wage offer (x) and acceptance wage, divided by previous wage, $(x - y)/w_0$	0.086
6. Direct cost of search, per month, c	\$85.14
7. Price of unemployed time, per month, w_U	\$90.69
8. After-tax wage, $(1-h)w_0$	\$265.20
9. Ratio of value of home time, net of search, to previous after-tax wage, $\frac{w_N(1-s)}{w_0(1-h)} = \frac{w_U + c}{w_0(1-h)} - R_n\left[\frac{\beta(w_0 - y) + (1-\beta)\alpha(x-y)}{w_0}\right]$, where w_N = price of home time	0.206
10. Implied value, net of search, of home time, per month, $w_N(1-s)$	\$54.76

Source: See equation (A-7) and Appendix B.

cost (c), the expected wage (x), and the expected rehire probability (β). Stephenson's questionnaire estimate of c (Table A-1, line 6), is based on males 18–21 and may understate the direct search costs of all unemployed individuals; if so, it leads to an underestimate of $w_N(1 - s)$. The expected wage offer (x) in Table A-1 is assumed to lie halfway between the acceptance wage (y) and the previous wage (w_0). If instead the expected wage offer is equal to the previous wage, the resulting value of $w_N(1 - s)$ drops from 0.206 of the previous wage to zero. If, on the other hand, individuals are pessimistic and estimate the expected rehire probability as only half the actual value used in Table A-1, then $w_N(1 - s)$ increases from 0.206 of the previous wage to 0.300. This range of estimates of $w_N(1 - s)$ can be compared with the estimate of 0.338 arrived at from direct evidence on the price of home time given in the text.

APPENDIX B

Table Sources and Notes

THE SOURCES FOR several of the tables are given below. The first numeral in an entry refers to the line number of the table. The number in parentheses refers to the column number. The material that follows refers to the source and explains any qualifications to the data.

Table 1

1. *Dorsey.* (1) John W. Dorsey, "The Mack Case: A Study in Unemployment," in Otto Eckstein (ed.), *Studies in the Economics of Income Maintenance* (Brookings Institution, 1967), pp. 175–248. (5) Total listed in Table A-2, p. 235. (6) A very small number of women is included, see p. 200. (7) p. 203. (8) $2.46 per hour, or $98.40 for a forty-hour week, calculated from frequency distribution in Table A-11, p. 240. w_0 = $137, p. 203. (10) w_1 = $85, w_0 = $137, p. 203. (11) Median w_1 within six weeks (0.75 month) was $93; median w_1 for six to ten months (eight months) was $80. The linear rate of decline was (93 − 80)/93 divided by 7.25 months = 0.140/7.25 = 1.93 percent. (12) p. 203.

2. *Folk and Hartman.* (1) Hugh Folk and Paul Hartman, *Pensions and Severance Pay for Displaced Defense Workers* (U.S. Arms Control and Disarmament Agency, 1969). (5) p. 95. (7) Computed from bottom line, Table IV-8, p. 113. (8) Computed from frequency distribution in Table IV-9, p. 114. (10) Computed from last column, Table IV-8, p. 113.

3. *Kasper.* (1) Hirschel Kasper, "The Asking Price of Labor and the Duration of Unemployment," *Review of Economics and Statistics*, Vol. 49 (May 1967), pp. 165–72. (5) p. 167. (7)–(9) p. 169.

4. *Perrella.* (1) Vera C. Perrella, "Young Workers and Their Earnings," *Monthly Labor Review*, Vol. 94 (July 1971), pp. 3–11. (5) Sample size not listed in article. (7) and (8) Table 1, p. 4.

5. *Sheppard and Belitsky.* (1) Harold L. Sheppard and A. Harvey Belitsky, *The Job Hunt: Job-Seeking Behavior of Unemployed Workers in a Local Economy* (Johns Hopkins Press, 1966). (5) Table 2-1, p. 18. (7) Table 2-7, p. 28. (8) p. 40. (10) Table 2-7, p. 28.

6. *Stephenson.* (1) Stanley P. Stephenson, Jr., "The Economics of Job Search: A Biracial Analysis of Youth Job Search Behavior" (paper presented at the 1972 annual meeting of the Econometric Society; processed). (5) p. 17. (7) and (8) p. 29. (9) Calculated from regression coefficient, p. 26.

7. *Wilcock and Franke.* (1) Richard C. Wilcock and Walter H. Franke, *Unwanted Workers: Permanent Layoffs and Long-term Unemployment* (Free Press of Glencoe, 1963). (5) Table 5, p. 49. (7) p. 143. (10) p. 144. (12) Median weekly amount of unemployment benefits was between $32 and $33, from p. 71. Converted to an hourly rate assuming 40 hours per week.

Table 2

1. *Ashenfelter-Heckman, line 1a.* (1) Orley Ashenfelter and James Heckman, "The Estimation of Income and Substitution Effects in a Model of Family Labor Supply," unpublished manuscript (forthcoming in *Econometrica*). Dependent variable is the proportion of the year at work, assumed to equal 1.0 at 2,000 hours. (4) Calculated from column (7) and $\overline{w}_i = 3.2$, $\overline{H}_i = 682$. (5) Calculated from columns (7) and (8) and means reported in Table 1. (7) and (8) Table 4, p. 13.

Heckman, line 1b. (1) James Heckman, "Shadow Prices, Market Wages, and Labor Supply" (National Bureau of Economic Research, October

1972; processed). (4) Reduction of work to 1,050 hours annually would reduce the wage 66 percent (from column 5) to $832 per year, or $0.79 per hour. (5) Table 1, p. 15, evaluated at 1,050 hours per year. See column (7). (7) Table 1, p. 15, presents an estimate that a 6.3 percent change in w_i is associated with a 100-hour change in annual hours. Evaluated for $\overline{w}_i$ = $2.33 (Robert E. Hall, "Wages, Income and Hours of Work in the U.S. Labor Force," in Glen G. Cain and Harold W. Watts (eds.), *Labor Supply and Income Maintenance*, forthcoming) and $\overline{H}_i$ = 1,050 hours.

Leibowitz, line 1c. (1) Arleen Leibowitz, "Education and the Allocation of Women's Time" (National Bureau of Economic Research, no date; processed). (4) See line 1a, column (4). (5) p. 13. (7) Evaluated at mean hours of work, H, from line 1a, column (4).

2. *Ashenfelter-Heckman, line 2a.* (1) Same as line 1a, column (1). (5) and (6) Same as line 1a, columns (5) and (6). (7) and (8) Table 4, p. 13.

Ashenfelter-Heckman, line 2b. (1) Orley Ashenfelter and James Heckman, "Estimating Labor Supply Functions," in Cain and Watts (eds.), *Labor Supply and Income Maintenance.* (5) Reported on p. 17 of typed manuscript. (7) Calculated from (5) with $\overline{H}$ = 2,272, $\overline{w}$ = 8.87.

Hall, line 2c. (1) Hall, "Wages, Income and Hours of Work." Hourly wage converted to annual earnings at 2,000 hours per year. (7) "The hypothesis that wage effects are absent for the 20–59 age group cannot be rejected" (quotation from manuscript). The figure in the table is derived by fitting a straight line visually to Figure 8-3 above $2.00 per hour.

Table 3

Lower unemployment, line 1a. (1) One percentage point of unemployment = 841,000 additional unemployed, calculated from *Economic Report of the President, January 1973*, Table C-24.[1] Average hours per man in 1971 in private nonagricultural industries were 37.0 per week times 52 weeks (*Economic Report, 1973*, Table C-30). (2) Private output per manhour equals total private product (*Economic Report, 1973*, Table C-9) divided by product of private employees (*Survey of Current Business*, Vol. 52, July 1972, Table 6.3) and average hours per man times 52 weeks. This is

1. Hereafter this document will be referred to as *Economic Report*, followed by the date.

then adjusted for the evidence, cited above, that the average wage of the unemployed in 1971 was 0.690 of the employed.

Entrance to labor force, line 1b. (1) Coefficients of labor force response to a change in the aggregate unemployment rate from George L. Perry, "Labor Force Structure, Potential Output, and Productivity," *Brookings Papers on Economic Activity* (3:1971), p. 564. 1971 labor force weights from *Manpower Report of the President, 1972,* Tables A-3 and A-4.[2] (2) Perry presents weights of the average weekly relative earnings by the same demographic groups in his earlier article, "Changing Labor Markets and Inflation," *BPEA* (3:1970), p. 440. These weights imply that groups that enter the labor force earn only 58.6 percent of the average for all employees. The figure in this table is private product per manhour times 0.586.

Higher hours, line 1c. (1) The response of hours to cyclical unemployment is estimated in Perry, "Labor Force Structure," p. 541. This response of 0.196 hours is multiplied by 1971 private employment, from *Survey of Current Business* (July 1972), Table 6.3. (2) Total private GNP per manhour, from notes to line 1a, column (2).

2. *Increase in productivity, line 2.* (1) Private manhours from average hours per man in line 1a times 52 weeks times number of employees, in *Survey of Current Business* (July 1972), Table 6.3. (2) Column (3) divided by column (1). (3) Line 3, column (3), minus the sum of lines 1a, 1b, and 1c for column (3).

3. *Market GNP, line 3.* (3) Perry, "Labor Force Structure," p. 557, estimates the Okun's law multiplier to be 2.7. Thus a 1 percentage point reduction in unemployment is associated with 2.7 percent extra GNP at current prices.

4. *Reduced search time, line 4.* (1) Line 1a, column (1) times ratio of search time to workweek (8.4/37.0). (2) $20.93 per week divided by a 37.0-hour workweek equals $0.57 per hour.

5. *Reduced waiting time, line 5a.* (1) The negative of line 1a, column (1) minus line 4, column (1). (2) Same as line 4, column (2).

Entrance to labor force, line 5b. (1) Copied from line 1b, column (1). (2) Estimated average price of home time for women, men, and teenagers (from text discussion above) was weighted together with demographic weights corresponding to cyclical response of these groups to changes in

2. These documents are hereafter referred to as *BPEA* and *Manpower Report*, respectively, followed by the date.

the labor force, from the same source used in line 1b, column (1). For the purpose of this calculation the price of time of those in the 20–24 age group was assumed to be midway between the values for teenagers and adults of each sex.

Higher market hours, line 5c. (1) Line 1c, column (1). (2) Assumed to occur at the margin. Evaluated at 1971 average hourly wage, adjusted for fringe benefits and taxes, but not commuting costs.

6. Total, line 6. Sum of lines 3–5.

Table A-1

1. *Discount factor.* The expected length of job tenure is set at the average interval between unemployment spells, which is approximately equal to the inverse of the average number of spells per year (0.98), calculated as a weighted average of the individual demographic group data for spells per year for a 6.0 percent aggregate unemployment rate presented by George L. Perry, "Unemployment Flows in the U.S. Labor Market" *BPEA* (2:1972), Table 3, p. 259, when combined with 1971 unemployment weights from *Manpower Report, 1972,* Table A-15. At a 2 percent monthly discount rate, which seems plausible for the uncreditworthy unemployed, $R_n = 10\ 6$.

2. *Expected rehire probability.* This estimate is the product of 0.37, the percent of the unemployed who were rehired in 1971, and 0.332, the monthly probability of rehire for this group. The first figure is derived from *Manpower Report, 1972,* Tables A-21 and C-10. Table A-21 shows that in 1971, 46.3 percent of the unemployed lost their last job. It is assumed that the group expecting recall is equal to the actual fraction of layoffs that was rehired in manufacturing. For the years 1957–71, rehires, which can be approximated by accessions minus new hires, equaled on average 0.8 of layoffs in manufacturing (Table C-10) ($0.8 \times 0.463 = 0.370$). The average duration of unemployment for those who lost their last job was 3.01 months in 1971, implying a monthly β of 0.332 (*Manpower Report, 1972,* Tables A-21 and A-22) for those expecting recall ($0.370 \times 0.332 = 0.122$).

3. *Difference between previous wage and acceptance wage, divided by previous wage.* The calculation of w_U in the previous text discussion estimated y/w_0 as 0.828. Thus $(w_0 - y)/w_0 = 0.172$.

4. *Probability of finding a job.* This figure is a weighted average of the separate probabilities for six age-sex groups provided in Perry, "Unem-

ployment Flows," Table 8, p. 277. Weights are the shares of each group in 1971 unemployment, from *Manpower Report, 1972*, Table A-15. Perry's probabilities are presented for whites and nonwhites separately; in my calculation, weights for all unemployed workers (for six age-sex groups) are applied to the white probabilities only, since separate share data for whites and nonwhites were not available. Also the probability data for adults cover the 25–29 age group, whereas the share data include the 25–64 group.

5. *Difference between expected wage offer and acceptance wage, divided by previous wage.* The mean wage offer is assumed to be halfway between the previous wage and the acceptance wage, so this line equals one-half of line 3.

6. *Direct search cost.* Stanley P. Stephenson, Jr., has provided me with unpublished results of his extensive thesis questionnaire for teenage males (cited in Table 1, line 6), separated for whites and blacks. Direct search cost includes travel cost (a sum weighted by mode, distance, and cost), cost of letters, cost of phone calls, expected moving costs, expected private agency costs, and other expected costs. The weekly results are converted to monthly values and weighted by the 1971 U.S. shares of whites and blacks in total unemployment.

7 and 8. Estimated in previous text discussion.

Table C-1

Number of unemployed, columns (1) and (3). Manpower Report, 1972, Table A-21, does not separate the group whose unemployment has been of 15 weeks' duration and over between groups with 15–26 and over 26 weeks' duration, whereas Table A-22 separates these two duration groups but does not give separate figures by reason of unemployment. The 15 and over group was separated into 15–26 and over 26 for recalls and nonrecalls by assuming that the proportion of recalls in the total 15 and over group (from Table A-21) also represented the proportion in the separate 15–26 and over 26 subgroups.

Visits, columns (2) and (4). For each group 1.16 Employment Service visits are added in the first month (see Appendix C). Male nonrecall company visits are estimated from exponential distribution, equation (a) in Appendix C, note 5, as follows. All duration groups made 8.87 company visits in the first month (this is the estimate of the exponential distribution

for a 2.0 week duration), plus the 1.16 Employment Service visits, or a total of 10.03 visits in the first month. The average duration in the 5–14 group was assumed to be 9.5 weeks. For this group the average number of company visits beyond the first month is given by the intersection of the exponential distribution at 9.5 weeks (5.66). The average of 10.03 visits per month for the first four weeks and 5.66 per month for the next 5.5 weeks is 7.79, the figure shown in column (4), line 1b. An analogous procedure was followed for the 15–26 and over 26 groups. Figures on female company visits are all equal to 43 percent of the equivalent male figures (see text discussion above). Figures in column (3) for recalls are in each case estimated by exactly the same procedure, based on equation (b) in the previous footnote instead of (a).

APPENDIX C

Evidence on Hours Spent in Search Activity

AN EXTENSIVE BATTERY of questions on job-finding techniques was included in the Sheppard-Belitsky and Stephenson surveys (see Table 1), asking about the use of different search techniques and the number of visits to company hiring gates. Of the male blue-collar respondents in the Sheppard-Belitsky survey who had completed their spells of unemployment, those finding new jobs each visited an average of 13.6 companies, whereas those who had been laid off and were recalled to their original jobs visited 8.5 (thus contradicting the implication of previous analysis that potential recalls do not engage in search activity).[1] The frequency distribution of visits per month appears to have a steep negative slope, since those finding new jobs visited 8.9 companies in the first month of unemployment (5.6 for recalls).[2] Thus for both groups, 66 percent of the visits were made

1. Harold L. Sheppard and A. Harvey Belitsky, *The Job Hunt: Job-Seeking Behavior of Unemployed Workers in a Local Economy* (Johns Hopkins Press, 1965), Table 3-18, p. 55, and p. 56.

2. *Ibid.*, p. 81; 41 percent started their job search on or before the first day of unemployment (Table 3-1, p. 32).

during the first month of unemployment, even though 46 percent of the new-job group were unemployed for 5 or more weeks with an average duration of 20.0 weeks.[3] Spreading the remaining 34 percent of the visits over the total unemployment period of this group implies an average of only 3.0 visits per month beyond the first month.[4] For the recall group the equivalent figure is 2.4 per month beyond the first month.[5] While no details are available for the women in the sample, their average number of total visits per spell was only 43 percent of the male average.[6]

The other important search technique identified by the Sheppard-Belitsky sample was reliance on the State Employment Service, which 84 percent of the respondents visited.[7] Unfortunately, the number of visits to the service is not reported, but rather the "number of types of help" received there. From the published distribution, I estimate an average of 1.16 trips to the service during a spell of unemployment for purposes other than regular reporting for unemployment benefits.[8] If all trips for these

3. *Ibid.*, Table 2-4, p. 24. The 1963 and 1964 shares of each duration group are listed separately. Since the survey extended from January 1, 1963, to March 31, 1964, average shares of each duration group for the entire period are estimated by applying weights of 0.8 to 1963 and 0.2 to 1964. The assumed average durations are 9.5 weeks for the 5–14 week group, 20.5 weeks for the 15–26 week group, and 35 weeks for the over 26 weeks group.

4. Of the 128 individuals in the new-job group, 46 percent were unemployed an average of 20 weeks, or an average of 15 weeks beyond the first month of unemployment. Thus 883 man-weeks of search activity accounted for only 602 company visits (128 individuals times the 4.7 visits not accounted for by search in the first month).

5. These results are roughly consistent with the following exponential functions for the number of visits per month (V):

(a) $$V = 10e^{-.06t} \text{ (those finding new jobs)}$$

(b) $$V = 6.3e^{-.06t} \text{ (recalls),}$$

where t is the average number of *weeks* of unemployment of each duration group. These functions were fitted (by eye) to the distribution of duration groups on the assumption of a 2.0 week average duration of the group unemployed less than 5 weeks, and the average durations assumed above for the three groups unemployed more than 5 weeks.

6. *Ibid.*, Table 3-16, p. 53.

7. *Ibid.*, Table 3-9, p. 45. The equivalent figure for the United States as a whole in 1971 was only 30.8 percent, from Table 1 in Thomas F. Bradshaw, "Jobseeking Methods Used by Unemployed Workers," *Monthly Labor Review*, Vol. 96 (February 1973), pp. 35–40. Sheppard and Belitsky found that only 34 percent spontaneously reported use of the State Employment Service, but 84 percent reported such use when asked directly, and 49 percent said that the service was the first place visited. *Job Hunt*, p. 46, and Table 3-12, p. 48.

8. *Ibid.*, Table 3-15, p. 52, shows a distribution for "types of help received" ranging from zero to three or more. Since an individual checking with the agency who received

other purposes are assumed to have been made during the first month of unemployment, total trips including both company and Employment Service visits total 10.1 in the first month and 3.0 per month in subsequent months for males finding new jobs (6.8 and 2.4, respectively, for recalls). There are also an estimated 2 required reporting visits per month for the subset of the unemployed who are eligible for benefits.[9]

The other job sources reported by a majority of the Sheppard-Belitsky sample were newspaper ads and "friends and relatives." Others were used by only a small minority of the sample.[10] In the absence of detailed information I am inclined to add one hour per weekday to the total of search time, mainly for extra newspaper reading (beyond the home time normally devoted to newspapers by employed individuals), and planning search activities. The number of visits to private employment agencies will be assumed to equal those made to the State Employment Service.[11]

As a crude approximation I assume that the time devoted to any other techniques by the entire sample just balances the time saved by the 28 percent minority who did not visit any companies at all, and thus the data on reported company visits will be applied to all of the unemployed. This practice probably overstates the intensity of search activity, since a full 56 percent of male blue-collar workers in the sample reemployed at new jobs first heard about those jobs from friends, relatives, or other workers, and many of them may not have traveled farther than their own telephones.[12]

no help was probably just registering for unemployment benefits, I assume one trip for the "zero types" group, and one trip per type of help for the remainder. These figures apply to both men and women, who reported an identical extent of use (84 percent). *Ibid.*, Table 3-9, p. 45.

9. The present practice in Illinois requires biweekly reporting in person to maintain eligibility for unemployment benefits. The problem of benefit termination after six or nine months is ignored, because of the relatively small number of long-duration unemployed in the relatively prosperous economic environment that is the subject of this paper.

10. No information on intensity of use is available for techniques other than company visits. The percentages of blue-collar workers reporting use of the techniques (when directly asked) were, for newspaper ads (88), Employment Service (84), friends and relatives (81), company hiring gate (76), government agencies (31), unions (24), religious and fraternal organizations (23), and private employment agencies (19). *Ibid.*, Table 3-11, p. 47.

11. Since the fraction using private agencies and the State Service sum to unity (previous footnote), this is accomplished by applying the previously estimated Employment Service visits to the *entire* sample instead of only 84 percent.

12. Sheppard and Belitsky, Table 4-11, p. 89. The rest of the distribution on "where first heard of job" is direct company applications (15 percent), State Employment Service (14 percent), unions (6 percent), newspaper ads (4 percent), other (4 percent).

An estimate of total hours devoted to search requires information on the number of hours devoted to each company or Employment Service visit, including transportation time. Only anecdotal evidence is available to help establish a plausible guess. In his study of unemployment in the Great Depression, Bakke provides case studies of search techniques for the workers, including a daily diary for one man. His entries refer to between two and six company visits per morning, with no activity in the afternoon: "The first few days I hadn't the heart for more than a couple of tries a morning. I'm getting hardened to the word 'No' now, though, and can stick it the most of the morning."[13] Most visits were short, and the most time-consuming part of a visit was the early-morning wait caused by the desire to be first in line. Since transport cost was minimized by visits to neighboring companies on the same day, significant travel time for search activity was concentrated at the beginning and end of each day and probably approximated commuting time.[14] Two hours per company visit seems a reasonable guess in light of these anecdotes and allows for half an hour each of travel and waiting, with an hour for applications, tests, and interviews.

Thus far the analysis has identified five components that may be used for a rough estimate of hours of search in the U.S. economy: (1) an exponential distribution of company visits for adult males, with the same distributions but smaller multiplicative constant terms for females; (2) an estimate of 1.16 Employment Service visits for unemployed individuals in all demographic groups; (3) an average of 2 unemployment benefit visits per month—which must be weighted by the fraction of the U.S. unemployed receiving benefits (0.43); (4) an extra hour per day for newspaper reading and planning (proportionately less here for recalls); and (5) an average of two hours per visit. These assumptions are combined in Table C-1 with the 1971 U.S. distribution of unemployment by demographic and

13. E. Wight Bakke, *The Unemployed Worker: A Study of the Task of Making a Living Without a Job* (Yale University Press for the Institute of Human Relations, 1940), p. 171.

14. "Most men lived considerable distances from the center of employment and every time they looked for a job, they had to spend at least 10 cents on carfare. When one realizes that 10 cents would buy an additional quart of milk, one understands why many hesitated before starting out. If they were to make a day of job hunting, they would need another 10 cents for a bite of lunch. . . . He usually managed to come home by noon in order to save lunch money and because he realized that the afternoon was not a good time for job hunting." Eli Ginzberg, *The Unemployed* (Harper, 1943), pp. 124–25.

Table C-1. Number of Unemployed, and Average Company and Employment Service Visits per Unemployed Person per Month, by Duration of Unemployment and Sex, and Estimate of Total Search Time, 1971

Description	*Recalls*		*Nonrecalls*		
	Number of unemployed (thousands) (1)	*Visits per month* (2)	*Number of unemployed (thousands)* (3)	*Visits per month* (4)	*Total unemployed* (5)
Duration of unemployment (weeks)					
Males, aged 20 and over					
a. 0–4	385	6.75	399	10.03	784
b. 5–14	363	5.14	315	7.79	678
c. 15–26	195	3.75	144	5.80	339
d. Over 26	164	2.73	120	4.25	284
Females, aged 20 and over					
a. 0–4	193	3.56	578	4.97	771
b. 5–14	182	2.51	316	3.67	498
c. 15–26	101	1.75	111	2.64	212
d. Over 26	81	1.26	88	1.91	169
Males and females, total	1,664		2,071		3,735
Number of visits					
Employment-related	...	4.24	...	5.93	5.17
Unemployment benefit-related	...	0.86	...	0.86	0.86
Total visits	...	5.10	...	6.79	6.03
Search time		*Per week (hours)*		*Per week (hours)*	*Per week (hours)*
Direct job search	...	2.35	...	3.13	2.78
Newspaper and planning time	...	3.75	...	5.00	4.44
Total search time	...	6.10	...	8.13	7.22

Sources: Appendix B and author's estimates discussed in text.

duration group. The data at the bottom of the table give, first, the average number of visits per month, then add in unemployment benefits, and then convert this figure to hours per week at an assumed duration of two hours per visit. The rather surprising conclusion is an average of only about 7.2 hours per week of search activity, or about 19 percent of the normal working week.

These estimates, based on the Sheppard-Belitsky study, are subject to a number of possible biases. Erie has a relatively small metropolitan area (264,000 in 1970), and job searchers may visit more companies in larger areas. An opposite bias may be the small proportion of blacks in the Erie population (3 percent in 1970); according to Stephenson's unpublished data, black teenagers in Indianapolis had only 57 percent as many average weekly contacts with firms as whites.[15] Another important limitation of the Erie survey is the predominance of blue-collar workers in the sample. Rees and Shultz present evidence indicating that blue-collar workers are much more dependent than white-collar workers on informal job sources (referral by another employee, and by other employers).[16] This may explain why on average they make so few visits to companies or the Employment Service. But while white-collar workers make more use of formal sources, the major ones are newspaper advertisements and private employment agencies. In principle these sources should require less search time than visits to company hiring gates without any previous leads, because when the searcher sets out with his want ad or his private agency referral slip in hand he knows that a job is available. My rough guess is that the greater reliance on formal sources by white-collar workers is balanced out by a smaller number of visits once a lead is obtained from a want ad or private agency. Therefore the results of Table C-1 will be applied to all unemployed adults in the United States, both blue- and white-collar.

Stephenson questioned 281 Indianapolis unemployed male teenagers about their search activity. For whites the average intensity of search was

15. They were unemployed about twice as long, so their total number of contacts was about the same. Stanley P. Stephenson, Jr., "The Economics of Job Search: A Biracial Analysis of Youth Job Search Behavior" (paper presented at the 1972 annual meeting of the Econometric Society; processed).

16. Albert Rees and George P. Shultz, *Workers and Wages in an Urban Labor Market* (University of Chicago Press, 1970), Table 13.1, pp. 201–02. The following are average percentage shares of the reported job sources by type (rehires and "unknown" are excluded):

Job source	*Four white-collar occupations*	*Eight blue-collar occupations*
Informal referral	38.7	70.1
Gate application	6.5	11.4
State Employment Service	1.8	2.3
Private agencies	22.2	2.6
Newspaper advertisements	21.7	9.1
Other (schools, unions)	9.3	4.4

4.15 average weekly contacts with firms, somewhat higher than in the Erie study of adults. The average duration of unemployment for the white teenagers was only about one month, with a total of about 17 visits per month. The black teenagers in Stephenson's sample made 10.3 visits per month. The comparable figure in the Erie sample for the adult males looking for new jobs who were unemployed less than six weeks (Table C-1, column 4) is 9 company visits. This discrepancy might be caused either by a higher intensity of job search by teenagers due to the lack of employed friends to refer them informally to job vacancies, by a low price of home time in alternative activities, or perhaps by the larger size of Indianapolis relative to Erie.[17]

When the white and black teenage results are weighted by the relative shares of the two groups in U.S. teenage unemployment, the average is 15.7 visits per month, or almost 10 visits more than for adult males, and this implies an average of 4.9 hours per week of extra search by teenagers. Maintaining the Erie result that women search half as much as men, a weighted average for total unemployment that combines the Erie adult results and the Indianapolis teenage results yields an overall average of 8.4 hours per week.

Other scattered pieces of evidence are reasonably consistent with these estimates. One detailed diary study classified individuals as unemployed if they were "without regular employment." The males in this group spent 15.4 hours per week on "work" and an additional 3.5 hours per week in "transportation." Since some portion was presumably devoted to search and the remainder to part-time or casual jobs, these figures set upper limits on search time for the sample because every hour of the rest of the week is accounted for in detail.[18] Most of the psychological studies of the impact of unemployment emphasize the continued presence of the unemployed husband at home.[19] Finally, the Wilcock-Franke study of plant closings in

17. Stephenson also reports asking a subsample of 93, "How many days per week did you spend looking for a job?" The mean answer was 2.94, but this does not tell us the number of hours per day.

18. George A. Lundberg, Mirra Komarovsky, and Mary A. McInerny, *Leisure: A Suburban Study* (Columbia University Press, 1934), Table 2, p. 97.

19. "Most wives testify to the increased irritability and conflicts due to the man's presence at home. . . . The husband's share of household duties is another source of irritation. Now that he is idle most of the time, how much should he be expected to help his wife?" Mirra Komarovsky, *The Unemployed Man and His Family: The Effect of Unemployment Upon the Status of the Man in Fifty-nine Families* (Dryden Press, 1940), p. 39.

the late 1950s reports a search pattern consistent with the Sheppard-Belitsky and depression evidence of relatively intensive search at first, followed by little or no effort:

> . . . for those who became long-term unemployed, there was a tendency to stop making the rounds after a while and to rely on the hope that something would turn up from companies where applications had been filed or to wait for the "grapevine" to supply information that a certain company was hiring. As one of the East St. Louis interviewers described it: "When the first frantic period of job seeking was over, people tended to settle down at home, reluctant to pound the pavement or waste precious dollars driving around fruitlessly—hence, the heavy reliance on the grapevine and upon friends and relatives."[20]

20. Richard C. Wilcock and Walter H. Franke, *Unwanted Workers: Permanent Layoffs and Long-term Unemployment* (Free Press of Glencoe, 1963), p. 115.

Comments and Discussion

William Nordhaus: Gordon investigates the extent to which temporary and permanent deviations of actual from potential output have offsetting, but generally unmeasured, costs. The reasoning can be broken into three steps:

1. First, the marginal product of a manhour diverges from the average gross wage. According to most short-run productivity studies the impact, short-run (one year), marginal product of a manhour is about two times the gross wage. The long-run evidence is less clear.

2. Second, the additional manhours put to work come from nonmarket activity (for example, leisure, waiting, searching, sleeping) that has a lower value.

3. Finally, taxes, commuting, unemployment compensation, and so on, introduce a very large wedge between gross wage and net wage.

The upshot is that the marginal product of a manhour is, according to Gordon, about eight times its social cost in the short run. It is not surprising that he concludes that Okun's law stands intact when embedded in a broader accounting system which includes the value of unmeasured activities.

I think that this approach to policy decisions is in principle correct. The paper does, however, point out the great difficulties involved in doing the theoretically correct calculations.

I want to raise a couple of questions regarding the calculations. Gordon has reckoned with the value of nonmarket time including leisure; but

while he has included the Fifth Dimension, he forgets about the fourth. Consider what the "temporary case" involves. Gordon says that in a "temporary" boom (reducing unemployment by, say, 1 point in one year) the elasticity of labor inputs with respect to output is two-thirds, a reasonably well-established number. In the next section, he argues on theoretical grounds that when the rest of the lagged terms are added up, the total elasticity of labor inputs with respect to output rises to about 1.35. Thus, as the lag works out through the years after the boom, the *deferred* cost is about 0.68 unit of manhours. Perhaps, with discounting, the sum of the current and deferred costs is lower than 1.35. If the mean lag were around two years and the discount rate 10 percent, the elasticity would be 1.12 rather than 1.35. The result is that unless there is some kind of variable coefficients model, the input costs Gordon presents should be roughly doubled.

The next question (point 3 above) is the striking difference between the value of output and the value of the manhour inputs into output. Recall from Table 3 that the marginal product per manhour is \$8.57 (= 28.36/3.308), while the marginal cost is \$1.14 (= 3.78/3.308). The discrepancy reflects the fact that, relative to leisure and unemployment compensation, working, commuting, and paying taxes are an incredible hassle.

I am a little uneasy about the treatment of taxes. Gordon uses a weird mixture of neoclassical and neo-Keynesian economics: He assumes households are good utility maximizers but that somehow labor markets and firms are in perpetual disequilibrium. The argument revolves around whether the lower level of unemployment he considers is sustainable in the long run at the going prices, interest rates, wages, tax rates, and so forth. If Gordon had a world without uncertainty or involuntary unemployment, I think the argument would be unacceptable. He treats taxes as a deadweight loss—something designed simply to throw away utility. The modern neoclassical treatment (following Ramsey in 1927, Boiteux, Diamond, Mirrlees, and others) is that in a well-designed tax system, the budgetary costs of public goods (perhaps including transfer payments as a public good) are below the true costs by just this wedge between gross and net wage. In the long run people will not increase work effort without a change in the real after-tax wage. In the long run, higher tax yields require higher tax rates and greater distortions. But Gordon's world is not this smooth world, but rather the world described by Tobin—stochastic supplies and demands and continuous flux. I don't know whether the effect of changes

in government fiscal or monetary policy in the long run looks more like the Keynes-Tobin-Gordon view or more like the smooth neoclassical view. If the latter, then again Gordon is equating the social cost of policies with their impact effects, whereas he should be considering the (properly discounted) long-run effects.

Incidentally, the modification for disutility of work that he mentions is not correct. As long as goods are the numeraire, the wage already nets out that effect. Also, Gordon is double-counting by adding the gross investment in search (Table 3, line 4).

As far as the permanent effects are concerned, Gordon has provided a very interesting way of looking at the reserve army of the unemployed. Ignoring capital, taxes, and the rest, this is how I see the argument: Vacancies and unemployment are in a constant state of creation and decay. The important point is that the vacancy rate is easily modified by a firm's manpower policy. Every vacancy is an indication that the marginal product is greater than the going wage, and we could perhaps argue that a stochastic equilibrium would lie where the equilibrium amount of hoarded labor—the precautionary demand—would be such that at *normal* unemployment rates (u) and vacancy rates (v) the wage would equal the average cost of a vacancy. If policy engendered an extra vacancy, the *net* marginal output forgone per unit change in the vacancy rate would be zero. Given this calculation, it is hard to see how Gordon arrives at his figures for the costs of a vacancy.

The argument for the costs of unemployment are also problematical. As I noted above, it is not proper to add to income the individual's imputation to the value of search: This is like gross investment. The only true costs of a lower unemployment rate are the drain of time from other utility-yielding activities, such as leisure, do-it-yourself projects, and so on. All of these considerations make one reluctant to take the Beveridge relation between u and v as stable over time, as Gordon must do.

Gordon seems unusually wary about using the actual numbers for vacancies and unemployment for determining the optimal rate. For Britain, which assiduously collects such statistics, the Beveridge point (calculated as $\sqrt{vu}$) was about 1.2 percent until the recent unemployment insurance and other reforms, then rose to 1.5 for 1972. (I ignore differences in definition of unemployment.) For U.S. manufacturing (the only sector for which vacancy data are available), the Beveridge point for 1969–72 was about 2.0 percent. Since unemployment rates in manufacturing run about 1.1 times

the national average, the national Beveridge point might be around 1.8 percent. According to Gordon, the optimal unemployment rate would be around 1.0 percent. It is instructive to note that the United Kingdom has operated at an average rate 1.5 times its "optimum," while the U.S. average is closer to 3 times its "optimum."

WilliamPoole: I am in general agreement with Bob Gordon's analysis, but feel that certain points deserve greater emphasis. For the purposes of my discussion I will assume that the natural unemployment rate hypothesis is correct, at least above some threshold inflation rate. And rather than the natural rate of unemployment, I prefer to talk of the natural rate of non-employment or, what is equivalent, the natural rate of employment.

First assume that the economy has settled down to equilibrium growth at the natural rate of employment. In such a situation there are three types of nonemployment. The first type arises from the labor-leisure choice, the second from job search, and the third from labor market imperfections.

In long-run equilibrium, measured unemployment reflects in part the fact that some people work in industries subject to seasonal and random influences, but nevertheless may be considered fully employed. Many such workers average 40 hours per week over time through a combination of, say, 60-hour weeks and unemployed weeks. While some people are surely trapped in undesirable jobs with fluctuating employment, others, such as farmers with seasonal crops and Brookings panel members who must work overtime to meet publication deadlines, obviously choose such jobs voluntarily.

Search unemployment arises from the continual micro adjustments within the macro equilibrium. Micro disequilibrium reflects the reallocation of resources in response to ongoing supply and demand shifts. Search unemployment settles down, in principle, to an optimum in the macro equilibrium. People refuse some jobs in order to search for others that are more rewarding in both a personal and a pecuniary sense. Search is a productive activity in that worker satisfactions and total output, taken together, are maximized when individuals search long enough to make the best possible match between employee and employer.

The third form of nonemployment at the natural rate of nonemployment stems from imperfections such as the minimum wage, information externalities in the labor market, union monopoly power, and firm monopsony power. Another imperfection—the one that Gordon emphasizes—is the

distortion of the labor-leisure choice by the personal income tax. While some of these imperfections can and should be corrected, the cost of correcting others may be greater than the benefit. The income tax, for example, has certain advantages over alternative taxes.

Gordon's equation (9) is a mathematical statement of this analysis. An alternative mathematical statement, obtained by using Gordon's identity (10) instead of the identity $Q \equiv qM$, is given by

$$(9a) \qquad \frac{dZ}{de} = \frac{p_Q}{p_Z}\left[\frac{dK}{de} + \frac{dT}{de} + M\frac{d(w/p_Q)}{de} - \left(\frac{w - w_U}{p_Q}\right)\frac{dU}{de} - \left(\frac{w - w_N}{p_Q}\right)\frac{dN}{de}\right].$$

In the long run it can be assumed that $dK/de = dT/de = 0$, since the capital stock is adjusted to the amount of employment and tax rates are adjusted to yield the optimal amount of revenues. However, $M[d(w/p_Q)]/de$ is positive, reflecting the labor-leisure distortion from the income tax, and so dZ/de is also positive.

For the moment, let us interpret w, w_U, and w_N as economy-wide averages. The natural-rate hypothesis is simply that market forces tend to equate w, w_U, and w_N and that these forces are independent of the rate of inflation in the long run. Without attempting to argue the validity of this view, I do want to emphasize that there exists an unemployment rate low enough such that $(w - w_U)$ and $(w - w_N)$ both become negative. This situation can occur during a period of generalized excess demand as a result of adjustment lags. For example, some union contracts provide for compulsory overtime, which is acceptable to workers unless it is invoked repeatedly during a period of excess demand.

What all this means is that above the natural rate of employment additional employment is a "bad" rather than a "good." Above the natural rate it is incorrect to speak of a tradeoff between unemployment and inflation. Individuals have too little leisure, on average, and they search for too short a period when unemployed. Some individuals and firms suffer a loss of productivity from supply shortages. Family and health problems caused by excessive hours of work are no less real than those arising from too little work. While it is true that excessive hours of work seem more easily avoided than deficient hours, many find that a long-run career demands excessively long hours from time to time.

Gordon's approach recasts the standard unemployment-inflation tradeoff argument by introducing the concept of an optimal rate of employment. This is an open invitation to examine the costs of overfull employment, instead of pursuing the tradeoff approach, which invites examination of the costs of inflation.

Gordon's empirical work has concentrated on the unemployed. Equation (9) is applied not to economy-wide averages for w, w_U, and w_N but rather to averages for the unemployed. That w exceeds w_N by a substantial margin for the unemployed should not be surprising; after all, an individual for whom this condition was not satisfied would have no incentive to look for work. But in calculating the gains from reducing unemployment Gordon has made no attempt to measure the increase in w_N for those employed in the initial situation. At least in the temporary case it must be true that $(w - w_N)$ and $(w - w_U)$ become negative for some workers. There are costs as well as benefits to overfull employment.

Gordon's calculations may be interpreted as attempting to measure the possible gains from micro policies that succeeded in reducing the unemployment rate by 1 percentage point. The gains would be larger than he estimates to the extent that these same policies improved productivity in labor-short industries and reduced strains on the overemployed.

Gordon's calculations should not, I believe, be interpreted as measuring possible gains from macro policies that reduce unemployment by 1 percentage point. These calculations ignore the costs of overemployment. I haven't the foggiest idea how important these costs are at 5 percent unemployment, but I am convinced that as a matter of economic principle there must be an unemployment rate low enough that these costs would become important.

Gordon's neoclassical approach seems to require acceptance of the natural-rate hypothesis, but for good reason he does not want to entangle his paper in the natural-rate debate. He should not, however, justify his discussion of the permanent case as an attempt to measure the costs of pursuing macro policies aiming for 5 percent rather than 4 percent unemployment. Those who believe the natural-rate hypothesis do not typically advocate such an approach to policy. The natural rate of employment is not known, and it surely changes over time in response to demographic shifts, structural changes in the economy, and changes in the micro policies of government. Accordingly, the policy prescription should be for the government to maintain fairly steady policies until the full employment

zone is reached. If this argument is correct, the economy will then slowly gravitate toward the natural rate, whatever it may be.

Discussion

R. A. Gordon voiced the concern of several participants that the attempt to "price" the various components of an individual's time can be carried too far. Lawrence Klein added that the value of those factors related to unemployment, which are at best imperfectly computed in the paper, are outweighed by many other enormous costs. Valuing a man's time in terms of certain social costs and market wages overlooks the much more serious problem posed by the uneven incidence of unemployment. For with unemployment concentrated among groups such as teenagers and blacks, the long-run costs of social instability will certainly overshadow the relatively low wage value of their time.

Charles Holt pointed out that the people most involved in the job search process are those at the very low end of the income distribution scale. A slack labor market would be particularly injurious to this group. Holt felt that this question of income distribution should somehow have been more directly integrated into Gordon's formal analytical framework. He also was concerned that the psychic costs of unemployment were not more fully discussed in the paper. Many people experience job search as an anxiety-filled and painful experience, yet this dimension is not captured in Gordon's analysis or calculations. Holt also questioned whether the average duration of job search was an adequate measure of the situation the unemployed confront. The distribution of spell duration is highly skewed, with a sizable number of workers experiencing very long spells of unemployment. Unemployed workers confront this risk; hence, risk aversion would have been a valuable addition to the analysis of search behavior.

Responding to these arguments, R. J. Gordon agreed that, apart from his adjustment for the psychic costs of unemployment for adult males, his analysis did not take account of psychic costs or income distribution effects. Nevertheless, he felt that analysis of these nonquantifiable costs should rest on some measure of the aggregate social costs involved and of a related optimum unemployment rate. Referring to Holt's comment on risk aversion, Gordon reported the somewhat paradoxical finding of the Sheppard-Belitsky study, that persons who have been laid off search for jobs almost

as intensely as do the rest of the unemployed. This suggests that risk aversion plays an important role in the search process; even if the chance of recall is 80 percent, people will generally not risk indefinite unemployment by completely abstaining from search. Instead, they are apt to shop around and at least file job applications with other firms. Okun noted that, in contrast to his comments, Gordon's formal model assumes that those expecting recall refrain from search, and that this assumption complicates the algebraic development of the model.

Gordon also responded to several criticisms raised in Nordhaus' formal discussion. He insisted that he had not treated taxes as a deadweight loss; the extra dollars of tax revenue generated at a lower unemployment rate were valued exactly the same as the extra dollars of private after-tax income, without regard to the uses made of that tax revenue. Second, he argued that Nordhaus' "fourth dimension" of deferred manhours would not necessarily apply after a temporary boom—for example, if the productivity bonus reflected peak capacity. Finally, he reiterated that the social costs of vacancies should include an allowance for their costs to consumers.

Other assumptions involved in Gordon's analysis of the "temporary case" were also questioned by panel members. Saul Hymans observed that although Gordon posits a functional relationship between y, the acceptance wage, and x, the expected wage, there is also causation running from y to x.

Hyman Kaitz cautioned that many people who are entitled to unemployment compensation either do not claim their benefits at all or withdraw from the labor force for a while and then return, at which time they claim compensation benefits. This type of behavior would tend to increase the social costs attached to search time. R. A. Gordon noted that the marginal utility of home time, w_N, should decline as the duration of unemployment lengthens. The leisure time available the first week of unemployment might be welcome, but as time passed, it would be increasingly less so, and for many people would doubtlessly become a severe burden before long.

Referring to another of Gordon's assumptions, Okun pointed out that the price of search time should decline as the unemployment rate increases. Since the probability of finding a job is lower when the labor market is weak, the acceptance wage should be lower during such periods. Therefore, the same factors that are responsible for a lower acceptance wage at high unemployment levels should also reduce the value of search time at those levels. For this reason, Okun argued, it would be incorrect to use the price of search time prevailing at a 4 percent unemployment rate to value the

search time of the unemployed when the rate is pushed to 5 percent. The increment of search time might thus have zero or negative value rather than the positive value assigned it by Gordon.

The "permanent case" analyzed by Gordon generated considerable controversy, particularly his contention that only a small output or welfare bonus could be expected in the long run from a reduction in the unemployment rate. The main concern was with Gordon's three assumptions about vacancies that led him to estimate a productivity decline at lower unemployment rates: (1) that vacancies increase as much as unemployment declines in the 4 to 5 percent unemployment region; (2) that one-fourth of these additional vacancies cannot be foreseen; and (3) that the social cost of these unforeseen vacancies is equal to the wage of the job involved. The effect of these assumptions was to take away about one-third of the additional output that would have come from the additional manhours of work at the lower unemployment rate. This contrasts with the temporary case in which a substantial productivity *bonus adds* to the output associated with additional manhours.

George Perry questioned the first two assumptions. He pointed out that we know nothing at all about what fraction of vacancies are unforeseen. This unmeasurable number could be substantially smaller than the one-fourth that Gordon assumed and thus cut the estimated productivity loss from this source to a small fraction of Gordon's estimate. Offering a range of values and corresponding productivity estimates seemed the only way to deal with such an unknown quantity. Perry also pointed out that available evidence on vacancies suggests a much smaller absolute increase in their number than Gordon assumes for the 4 to 5 percent unemployment region. He noted that the point at which the increment in vacancies corresponds to the increment in unemployment has always been thought to come at much lower unemployment rates, as Nordhaus' discussion had pointed out.

Hyman Kaitz remarked that job vacancy statistics in the United States are generally considered to reflect somewhat lower vacancy levels than are suspected actually to exist, and that it was hard to guess what value was appropriate to Gordon's calculation. R.A. Gordon agreed and questioned whether Nordhaus, in his comments, was justified in comparing the British and American vacancy experiences. R. J. Gordon added that the much higher teenage and female turnover rates in the United States make the British example a special case. He went on to argue that U.S. data are not

sufficiently sensitive to detect the high vacancy rates that may exist in the service areas, for example, and that high unemployment rates there are also balanced by high vacancy rates, making the manufacturing data inapplicable.

Okun objected to Gordon's procedure of equating the price of a vacancy with the marginal product of an additional worker, reiterating Nordhaus' concern with that calculation. Ignoring extreme cases like Gordon's supermarket or an integrated production process where a missing man could force an assembly-line shutdown, Okun and Hall agreed that a vacancy has value only to the extent that it produces surplus. In that case, since a marginal worker's contribution to surplus is usually far exceeded by his real wage, Okun submitted that the cost of vacancies in Gordon's analysis is substantially overstated. He did not believe the inconvenience to consumers cited by Gordon should much change the aggregate estimate arrived at by looking at producers' surplus since producers take account of this in competing for customers. Moreover, in goods as opposed to services, the role of finished goods inventories as a buffer holds down the cost of a vacancy to both the seller and the customer.

In reply, R. J. Gordon expanded on the arguments offered in his paper. Describing a world in which the economy has been pushed to a low unemployment rate, he pointed to the fact that a vacancy causes inconvenience not only to the employer who is attempting to fill it, but also to the producer who finds his orders being shipped later than he expected and to the customer who must tolerate longer waiting lines. He agreed that the social cost of a vacancy was hard to guess; his supermarket example suggested that the cost could be much larger than the wage of the additional worker, but in other cases it might be smaller. His major aim in the paper had been to offer a conceptual framework into which readers could substitute their guesses when they differed from his.

In a concluding comment, William Fellner questioned the validity of calculating an optimal unemployment rate based on a crude comparison of aggregate vacancies and unemployed persons. Since, as the economy nears such an optimum, vacancies can represent demands for very specific kinds of workers, it is difficult to distinguish a precise point of optimality based on aggregate vacancy data alone.