EMPLOYMENT TAX CREDITS AS A FISCAL POLICY TOOL

A STUDY

PREPARED FOR THE USE OF THE

SUBCOMMITTEE ON ECONOMIC GROWTH

OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

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(II)

ERRATA Change to read:

Sec. 1.2, p.2, line 9: "to tariff protection (Bhagwati and Ramaswami)."
Sec. 2.3, p.7, line 6: "..., assuming average tax"
Sec. 3.2, p.15, line 7: "..., $(0 < L_B < L_2)$,..."
Appendix, p.24, lines 27-29: "The parameters include:
T = profit tax rate,
t = personal income tax rate, ..."
Appendix, p. 24, line (a)(2): "$Y_p = WL + (1-T)\hat{\Pi} + Ws(L-L_B) + kI$"
Appendix, p.25, line 5: "... $L_p < 0$,..."

LETTERS OF TRANSMITTAL

JULY 14, 1976.

To the Members of the Joint Economic Committee:

Transmitted herewith is a study entitled "Employment Tax Credits as a Fiscal Policy Tool," which was prepared for the Subcommittee on Economic Growth by Profs. Gary C. Fethke and Samuel H. Williamson of the University of Iowa.

Late last year, in response to our unacceptably high level of unemployment, Senator Bentsen introduced the Employment Tax Credit Act of 1975, and this study is based on the ideas in Senator Bentsen's proposed legislation.

Since the study by Professors Fethke and Williamson analyzes how an employment tax credit could reduce unemployment during a recession without increasing inflationary pressures, I believe the members of the Joint Economic Committee and other Members of Congress will find it most useful.

The views expressed in the study are those of the authors and do not necessarily represent the views of the members of the Joint Economic Committee or the committee staff.

HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee.

JULY 7, 1976.

Hon. HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a study entitled "Employment Tax Credits as a Fiscal Policy Tool" by Gary C. Fethke and Samuel H. Williamson, Associate Professors of Business Administration and Economics, respectively, at the University of Iowa.

In their study, Professors Fethke and Williamson provide evidence indicating that an employment tax credit could be a powerful countercyclical fiscal tool. Under their proposal, any employer would be allowed to take a tax credit for all workers hired above a base employment level, with the base adjusted downward when the economy is moving into a recession and adjusted upward when the economy is doing well—a variable base employment credit (VBEC). Such a VBEC would give firms an incentive to retain workers during a downturn, thus minimizing unemployment, since each worker laid off would reduce the firm's tax credit and, conversely, it would give firms an incentive to speed hiring during recovery, since each new worker would increase the tax credit.

Using a standard model of the American economy to test their idea, Professors Fethke and Williamson have reached a conclusion of no little importance to those of us in Congress—when properly administered, a variable base employment credit could reduce unemployment, increase GNP, and reduce inflationary pressures. Unlike more traditional expansionary measures which try to boost employment indirectly by increasing the nation's demand for goods and services (for example, through an income tax cut), and which could stimulate inflation, Professors Fethke and Williamson argue that a VBEC would reduce labor costs and thus induce firms to hire more workers, produce more goods and reduce inflation.

Right now, with the economy in the midst of a substantial recovery, we should begin to examine measures which could prevent future recessions or which could turn the economy back upward swiftly if another recession does occur. Professors Fethke and Williamson have analyzed one proposal that could be of great use in this effort.

Last year, I introduced legislation to establish an employment tax credit, and with a few changes it would conform to the VBEC proposed by Professors Fethke and Williamson. I hope the Joint Economic Committee can examine this idea closely in the near future.

The views expressed by Professors Fethke and Williamson in their study are those of the authors and do not necessarily represent the views of the members of the Subcommittee on Economic Growth.

Sincerely,

LLOYD M. BENTSEN, Jr.,
Chairman, Subcommittee on Economic Growth.

CONTENTS

EMPLOYMENT TAX CREDITS AS A FISCAL POLICY TOOL

By GARY C. FETHKE *and* SAMUEL H. WILLIAMSON [1]

1. AN OVERVIEW

1.1. INTRODUCTION

Recent experience with concurrent inflation and unacceptably high levels of unemployment in the United States has provoked skepticism and concern regarding the short-term countercyclical effectiveness of traditional fiscal and monetary policy tools. This dissatisfaction has generated many policy suggestions by prominent economists, politicians, and businessmen on how the Nation can meet the twin goals of full employment and price stability expressed in the Full Employment Act of 1946. Four newer forms of policy which have been explored are: (1) Direct controls or guidelines on wages and prices (some form of permanent incomes' policy); (2) simultaneous deployment of expansionary fiscal policy and tight monetary policy; (3) public service employment; and (4) wider use of tax credits, subsidies, and selective taxes as counter-cyclical fiscal measures. This paper examines and evaluates one form of countercyclical credit policy, known as an employment tax credit.

The basic rationale for a universal employment tax credit is straightforward. This program will provide employers tax credits on either wage rates, wage bills, or employment levels. These credits will directly reduce business labor costs without reducing labor incomes. By stimulating the demand for labor and the aggregate supply of goods and services, such a program would initiate increases in real GNP, and thereby increase employment.

An employment tax credit program differs from the emphasis of traditional fiscal and monetary policies which act directly to increase aggregate demand, and only indirectly to increase aggregate output. Furthermore, since the direct effect of the credit decreases business labor costs, its use to stimulate employment does not place significant pressure on prices or contribute, via Phillips Curve relationships, to inflationary pressure. In the short-run, the stimulus to employment encourages firms to utilize otherwise idle capacity and therefore moves the economy closer to full employment.

The program can be designed such that the level of the tax credit allowed can be varied in response to economic conditions. The universal nature of the program will not disrupt the operation of regional labor markets, and if there is any impact on the distribution of income, it will favor the low income and unemployed.

Opponents of employment credit policy insist that the plan will simply grant windfall profits to business, distort the allocation of resources, be difficult to discontinue, and lead to widespread cheating and misrepresentation. Examination of each of these potential shortcomings of employment credits reveals that appropriate administration can overcome them, or that they are exaggerated and of minor practical importance.

1.2. BACKGROUND OF EMPLOYMENT TAX CREDIT POLICY

To date, most employment tax credit proposals have been aimed at influencing the employment levels for particular groups or categories of labor, and thus are selective rather than universal in coverage. Selective wage credit programs have been analyzed in a number of contexts: (1) Depressed regions of a developed country (Borts, Lind, Serck-Hanssen, Archibald); (2) urban areas of developing countries (Hagen); (3) income maintenance (Kesselman, Barth, and Eisner); (4) job training of low-wage workers (Hammermesh); and (5) alternatives to tariff protection (Bhagwau and Ramaswani).

Limited employment tax credit programs have been introduced in developed countries, and some experience is available for review. In Britain, the Regional Employment Premium and Selective Employment Tax provide labor incentives by industry and location. In the United States, employment tax credits have been enacted under the job opportunities program, the AFDC work incentive program, and the training incentive payments program in New York City. These categorical programs, however, induce firms to substitute eligible workers for ineligible ones; and their net impact on overall employment, output, and prices is slight.

A universal employment credit program was first suggested by Nicholas Kaldor who argued that a wage subsidy would reduce labor cost, increase profit, and generally encourage private enterprise to expand employment. Kaldor also attempted to provide some empirical evidence regarding the net cost to government of a wage bill subsidy. Ragnar Frisch constructed simulations of tax and subsidy programs for the Norwegian economy, and was enthusiastic about possible counter-cyclical implications of wage-bill taxes and subsidies.

Most recently, Berndt, Kesselman, and Williamson simulated the impact on U.S. manufacturing of replacing the investment tax credit with an equivalant cost-to-government employment tax credit for the period from 1962 to 1971. Their principal conclusions were that total employment would have been one-half to more than 1 percent higher in many of the years, and that use of capital would have been 1 to 6 percent lower. They also argued that an employment tax credit would induce firms to substitute production workers for capital and non-production workers. Subsequent empirical work by Berndt, using the same data, revealed that the removal of energy price ceilings and investment incentives and the adoption of a 4 percent employment tax credit would have decreased energy use in manufacturing by 5 percent and increased employment by over 2 percent. Elsewhere, we have examined the aggregate impact on employment, output, wages, prices, and net Government revenue of alternative employment tax credit programs (Fethke and Williamson).

In the United States, a universal employment tax credit bill was introduced into Congress by Senator Jacob Javits in 1971. Legislation has recently been submitted by Senator Lloyd Bentsen in 1975 and Senator John Tunney in 1976. The concept has been reviewed by the U.S. Department of Labor, the Congressional Budget Office, the Council of Economic Advisers, and the Congressional Research Service of the Library of Congress.

1.3. TYPES OF EMPLOYMENT TAX CREDITS

Employment tax credits have been proposed in many forms. Each type has a different impact upon the price of labor services to the firm as well as a different impact upon aggregate supply and demand in the economy. In structuring the credit there are two policy parameters to consider: First, the type and amount of the credit, and second, the level of base employment beyond which the credit is offered.

One way of instituting the program is to offer a tax credit as a specified amount per worker employed. A single, universal credit of this form not only reduces labor cost but also lowers the cost of unskilled relative to skilled labor. This follows because a per worker credit represents a higher proportion of wages for low-paid, unskilled workers than for high-wage, skilled workers. This credit presumably stimulates employment of young people, women, and minority workers who comprise the major portion of marginally skilled workers and who represent a disproportionate share of the unemployed during periods of declining business activity.

An alternative type of credit is one given on a specified percent of the worker's wage. This form, which is actually a type of negative payroll tax, is neutral as to its effect on skill categories of labor.

The second policy parameter is the base level of employment beyond which employers qualify for the credit, and again there are several alternatives. First, a subsidy can be offered on the entire workforce. The advantages of this approach include ease of administration, low monitoring costs, and minimal difficulty in establishing criteria for inclusion. On the other hand, an across-the-board credit may prove expensive relative to its incremental impact on employment.

Second, a credit can provide a subsidy for newly hired workers who are drawn from the ranks of the unemployed; that is, a marginal employment tax credit. In this case, the base of the program is the actual (current) level of employment.

Finally, a variable base employment credit (VBEC) can be considered which permits a tax credit for workers hired in excess of a base level, with the base to be adjusted to reflect changing business conditions. During periods of rising unemployment, the base can be decreased; then during periods of recovery, it can be adjusted upward; and during boom periods, the credit can be abolished. It is also possible to adjust the base to reflect different employment conditions in regional or sectorial labor markets.

Marginal employment tax credits have received the most legislative attention. These programs appear attractive since they reward only net additions to the workforce rather than some percentage of old and new workers. The marginal credit, therefore, does seem less

vulnerable to the claim that employment credits simply provide a windfall profit to businesses.

A marginal credit is not as flexible a counter-cyclical fiscal policy tool as the VBEC on at least three grounds. First, a marginal credit is less effective in stabilizing existing employment since it does not penalize firms for laying off workers. A VBEC, with the base set below the current employment level, would protect existing jobs, since each worker laid off would reduce a firm's employment tax credit earned. Second, establishment of the base at last period's employment, or at the previous peak of employment, may either nullify any impact the credit may have, or worse, turn the credit into a procyclical measure. This follows because firms will typically ignore a marginal employment credit when employment is declining and rush to accept it when employment is expanding. Third, the more the credit is restricted to particular workers or employers, the less impact the program will have.

For these reasons, we do not feel that the program should be limited to presently unemployed workers. A reduction in unemployment will come through an increase in demand for all workers, and our results show that a VBEC is the most effective method of stimulating this demand. For the same reason, we do not feel the program should be restricted as to size or type of employer. A VBEC can be offered to any employer that makes social security contributions, including local governments, schools, and nonprofit organizations, as well as the business sector. In this way, a VBEC would have an even impact throughout the economy and would not distort employment patterns.

A difficulty with the VBEC is that administration will require the ability and power to change the level of the base as the economy moves through different phases of business activity, as well as the ability to evaluate employment conditions in heterogeneous labor markets. Given the track record of U.S. fiscal policy, this is no small administrative task.

1.4. APPROACH OF THIS REPORT

We prefer a variable base employment credit which provides a percentage reduction in the wage rate. A flexible base program has three desirable features: First, variation of the base can directly stabilize employment over the business cycle; second, the ability of administrators to set alternative bases for different sectors of the economy will assist in eliminating windfall profits; and third, the program's impact on aggregate demand can readily be altered through base and credit rate adjustment. In our analysis, therefore, we select a wage rate subsidy because it appears the least distortive, the most direct, and the easiest to administer.

In section 2, the macroeconomic effects of a VBEC are examined; in section 3, the impact of employment credits on the individual firm is considered; finally, section 4 contains a summary and concluding remarks.

2. MACROECONOMIC EFFECTS OF EMPLOYMENT TAX CREDITS

2.1. INTRODUCTION

This section describes the impacts of a VBEC program on key aggregate variables in the economy. In particular, we focus on the response of employment, real output, wages, prices, aggregate demand, and net cost to the government. The analysis is based on an evaluation of a multiequation model which is defined and briefly described in the appendix. Section 2.2 presents the analytical results that derive from mathematical analysis of the model. Of primary interest in this section is the specification of the set of conditions under which a VBEC can increase employment and output without increasing aggregate prices.

Using the aggregate model and recent U.S. data, section 2.3 presents a set of calculations of the numerical changes in the aggregate variables in response to an employment tax credit. These calculations are reported for different bases and for alternative forms of credit financing. Numerical results highlight the analytical findings, and indicate the likely changes of those variables whose behavior cannot be predicted solely on the basis of an a priori reasoning. The final subsection, section 2.4, compares VBEC's with other fiscal policies.

2.2. ANALYSIS OF THE MACROECONOMIC MODEL [1]

The model we use differs from simple Keynesian representations in two ways: First, labor supply, even during recessions, is not assumed to be infinitely elastic, but will increase as wages go up. Second, employment, output, prices, wages, et cetera, are described as jointly determined variables. This means there is feedback between labor, commodity, and money markets.[2]

Mathematical analysis of the model leads us to the following proposition: *An increase in a VBEC will expand employment, output, and real wages.* **These results hold for almost every configuration of personal and business tax rates, levels of unemployment compensation, labor supply responses, technological conditions, and forms of Government financing.**

The VBEC increases real demand for labor. Assuming some flexibility in the short-run supply of labor, employment expands in response to a rise in the real wage. The greatest rise in employment

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[1] The derivations on which this section is based are not presented in detail. They will be provided on request by the authors.

[2] Simple Keynesian models presume that real output is determined by real expenditure on consumption, investment, and government purchases. Given an infinitely elastic short-run supply of labor and constant product prices, unemployment is determined as the difference between full employment work force and the actual work force. The actual work force is the level of employment required to produce demand-determined real output. This sequence can be modified to accommodate changing wages and prices by adding a non-instantaneously clearing labor market (Peacock and Williamson).

occurs when the increment in the credit is large, the program base is low, and the short-run elasticity of labor supply is high.[3]

Mathematical analysis of the model, however, does not provide a clear-cut picture for the separate responses of money wages and aggregate prices. On the one hand, an increase in employment and thus real output reduces pressure on prices. On the other hand, an increase in aggregate demand, which would accompany the credit, tends to place upward pressure on prices. Therefore, the response of prices to a VBEC depends on the relative increases of supply and demand. We can show that when the Government finances the program by cutting expenditures by an amount equivalent to the credit-initiated loss in tax revenue, aggregate prices decline when the VBEC is increased. But when Government expenditures are set independently of the VBEC, the effect on prices is analytically indeterminate. Therefore, to determine if a VBEC is inflationary, it is necessary to examine in detail the program's relative impact on aggregate demand and supply. While these topics are best considered in section 2.3, which offers a selection of simulations under different strategies of financing the credit program, a few anticipative comments are useful.

On the supply side, wage and price responses to the VBEC depend on technological relationships between output and employment, as well as on the flexibility of labor supply. In the short-run, these responses are essentially empirically determined conditions, that is, they are parameters not subject to direct control. On the demand side, price and wage response to the VBEC depend upon the effect of the credit on consumption, investment, and Government purchases. These, in turn, depend upon the program base and the method selected by the Government to finance the program.

Of the several ways a VBEC can affect aggregate demand, its impact on consumption expenditure is the most obvious and important. The VBEC influences personal income and thereby consumption expenditure in three ways. First, there is a net increase in personal income for each new worker added to the workforce; specifically, the increase equals the difference between wage income and unemployment benefits. Second, if the credit increases money wages of existing workers, personal income will rise. Third, after-tax profits will initially increase by the amount of the credit.

It is also useful to explore the implications on aggregate demand of alternative credit-financing strategies. If Government expenditures are set independently of the VBEC, the credit is likely to be deficit-financed. It is conceptually possible for tax revenue to increase and unemployment benefits to decline sufficiently from new jobs generated by the VBEC that the deficit need not rise.[4] For typical values of tax,

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[3] The indirect effects on employment of changes in aggregate demand depend on the structure of the labor market. If workers possess a degree of money illusion, increases in aggregate demand and money wages act to increase employment and output. Increases on aggregate demand, however, have no impact on employment if the labor market exhibits a classical structure. In this case, while changes in aggregate demand affect wages and prices taken separately, there is no relation between total spending and employment.

[4] In fact, Nicholas Kaldor argued that a general wage subsidy program would be self-financing. We have extended Kaldor's analyses in another paper; see Fethke and Williamson.

behavioral, and credit parameters, however, the deficit will expand whenever Government expenditures are set independently of fiscal policy requirements. This type of program will therefore be one of the more stimulative methods of financing. Alternative Government strategies involve (1) reducing Government expenditures by an amount approximately equivalent to the outlay on the credit, or (2) increasing personal or corporate income taxes sufficiently to absorb the cost of the program. These approaches will typically not require as large an increase in the deficit as the case where expenditures are independently specified, but would not generate as much employment.

The effect of a VBEC on gross investment appears to be of minor importance. If the credit necessitates increased Government borrowing and the monetary authority does not accommodate this borrowing, then the rate of interest will rise and investment will decline. On the other hand, increases in output and employment will enlarge the usage of current capital stock and thereby stimulate gross investment. These effects are probably small or cancelling.

We conclude that the impact on aggregate demand of the VBEC can be controlled by appropriate selection of the employment base and Government financing strategy. In general, there is no reason why aggregate demand has to expand by more than the tax-credit-induced increase in aggregate supply. Thus, it is possible to initiate a VBEC that will augment employment, output, and money wages without causing increases in the aggregate level of prices.

In the following section, alternative methods of financing are examined in a series of numerical calculations. These results emphasize the flexibility of the tax credit program when the size of the credit, the program base, and the method of financing are jointly determined.

2.3. ESTIMATED EFFECTS OF A VBEC

The following calculations evaluate the impact of a VBEC on important endogenous variables in the aggregate model. The results represent the response of each variable to the implementation of a tax credit equal to 1 percent of the wages paid to all workers in excess of the firm's base level of employment. They are derived by specifying the form of the behavioral equations, assuming average rates and unemployment benefits, and using values of the endogenous variables from the U.S. economy for the fourth quarter of 1975.[5] As such, the results are not statistical estimates or predictions, but rather are simulated responses presented to illustrate possible impacts on the economy of a VBEC.

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[5] The initial values for the variables are from the Fourth Quarter 1975; they are:
$Y = GNP = \$1,572.9$ billion
$Q = $ real $GNP = 1,216.2$ billion (in 1972 dollars)
$P = GNP$ deflator $= 1.29$
$L = $ employment $= 77.6$ million employees
$W = \$10,700$ per employee year.

The income tax is assumed to be $t = 0.25$ percent, the corporate tax is $T = 0.39$ percent the unemployment benefits as a percent of the wage is $b/W = 0.36$ percent, and the investment tax credit is $k = 7$ percent. In the simulations, we assume money market and interest rate responses to the credit are very small so that gross investment does not respond to the credit and is fixed in money terms.

The approach taken involves assigning specific parameter values to labor supply and demand elasticities, output elasticity, and the marginal propensity to consume.[6] Then, the VBEC program is evaluated for three plausible methods of Government financing strategy and the complete range of prescribed employment bases. The calculations are presented in the table. In case 1, Government expenditures are exogenous (determined independently of the credit), all tax rates are assumed fixed, and the deficit adjusts. Case 2 involves reducing Government expenditure by the full cost of the employment credit (tax rates are still fixed). In case 3, Government expenditure (exclusive of transfers) and net tax revenue are held fixed, and the income tax rate is increased by enough to cover the full cost of the VBEC.

The table records the percentage changes in the levels of employment, real output, price, GNP, money wages, and profit. In addition, percentage changes in wages and profits are deflated by the percentage change in prices to show the impact of the credit on real wages and real profits. Profits are taxable profits plus employment and investment tax credits. Each vertical entry in the table represents the percentage change of the variable in response to a 1-percent VBEC. Each row depicts different levels of the base. The first entry for case 1, for example, indicates that a 1 percent credit, when the base percentage (L_B/L) is zero, employment will be 1.18 percent higher.

For cases 1 and 2, the last column in the table is the increase (decrease) in the deficit as a percent of tax receipts. For case 3, the last column shows how much the income tax rate must increase if tax receipts are to remain constant.

The calculations support the reported propositions of section 2.2. A VBEC will result in higher employment, output (real GNP), and real wage for all levels of the base and for each method of Government financing. Also, for each program presented, expansion of aggregate demand is never sufficient to cause prices to be higher. This attractive combination of results, higher employment and a lower level of prices, means that a VBEC is a fiscal tool that can shift the Phillips curve to the left. Thus, a VBEC offers an alternative to other fiscal programs which rely on rising prices to lower unemployment.

Other calculations, not reported here, indicate that a VBEC will initiate expansion in the aggregate price level only when the elasticities of supply of labor and output are much lower and the base is set at low employment levels. Even under these conditions, manipulation of the base can lead to reductions rather than increase in prices.

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[6] The behavioral equations used in the model as presented in the Appendix are specified as:

(7) $C = \alpha Y_d$
(10) $Q = AL^\beta$
(11) $W(l-s) = P\beta AL^{\beta-1}$
(12) $L = qW^\delta P^\gamma$

where α is the marginal propensity to consume, β is the elasticity of output with respect to employment, δ is the elasticity of labor supply with respect to the money wage, and δ is the elasticity of labor supply with respect to aggregate prices. The values assigned to these parameters are: $\alpha = 0.8$, $\beta = 0.53$, $\delta = 3$, and $\gamma = 1.5$. The value of α is arbitrarily assigned; however, alternatives do not change the results significantly. The assumed Cobb-Douglas production function with fixed capital resticts β to equal labor's share of total income, which is 0.53 for the data used. Also, the Cobb-Douglas production relationship resticts the price elasticity of demand to equal one. We experimented with several forms of labor supply. The one reported displays some money illusion. If $\gamma = 0$, then $L = qW^\delta$ and prices would have no effect on the decision to supply labor. If $\delta = -\gamma$, then $L = q(W/P)^\delta$, and the supply decision depends on the real wage.

We now turn to a more detailed examination of each method of financing the credit.

In case 1, where the deficit adjusts, the credit increases equilibrium GNP for all bases except the 100-percent base. The increase in real GNP, however, is greater than money GNP and prices fall. Thus, it is conceptually possible for aggregate demand to rise, and for prices to decline.

In cases 2 and 3, a decline in Government expenditures or a compensating increase in income tax rates reduces the expansion impact of the credit on aggregate demand. Therefore, the increase in supply is sufficient to achieve equilibrium at a lower level of money GNP. In case 2, the fiscal impact of the credit will not be completely offset by the reduction in Government expenditures. This follows because tax revenue will be lower with lower taxable profits. The last column shows, however, that the effect is quite small. In case 3, increasing the income tax rate to maintain constant tax revenues will actually produce a reduction in the deficit. In addition, higher income taxes reduce consumption expenditures. This case is the most deflationary and therefore stimulates the least expansion of output.

The impact of the credit on most variables is tied to the impact on equilibrium GNP. Employment, output, wages, and prices all move in the same direction as equilibrium GNP. The real wage varies inversely, reflecting the fact that workers are assumed to have some degree of money illusion and therefore do not react completely to the higher purchasing power of their wage.

A surprising result of the recorded calculations is that profit falls at the higher employment base levels. A decline in profit is the result of indirect effects of the VBEC and, specifically, the type of financing method selected by the Government. The credit indirectly increases wages received by workers and reduces product prices; at the same time, it directly lowers the immediate cost of labor. If these indirect effects outweigh the direct ones, profit will be lower. Thus, rather than offering windfall gains, as many argue, a VBEC can actually reduce profit.

Only for cases 1 and 2 are profits higher, and then only for low-base programs. In case 1, where GNP is higher, profits increase for bases less than 40 percent. In case 2, real profit expands for a zero and 10-percent base, and then displays negative changes. In case 3, the fall in profit is largest. Here, a rising base is associated with smaller declines in profit. The smallest fall in profit, for case 3, occurs at the 100-percent base.

The calculations present comparative static results which hold other exogenous variables and parameters constant. In other words, they do not mean that a 1-percent VBEC would, for example, cause prices and profits to fall, but that they will be different by the percent in the table. Therefore, if this model were a true representation of the U.S. economy, and a 1-percent marginal employment tax credit had been adopted in 1975 with no other changes in tax rate or expenditures, then the GNP deflator would have risen 6 percent instead of 6.5 percent, and profits 5.5 percent instead of 7 percent. The changes in the other variables would have differed accordingly.

SIMULATED IMPACT OF A 1-PERCENT EMPLOYMENT TAX CREDIT

[Percent change]

CASE 1—GOVERNMENT EXPENDITURES AND TAX RATES ARE UNCHANGED

Base percent	Employ-ment	GNP (real terms)	Price	GNP	Wage	Real wage	Profits	Real profits	Deficit
(LB/L)	(L)	(Q)	(P)	(Y)	(W)	(W/P)	(Π)	(Π/P)	(D)
0.00	1.18	0.62	−0.11	0.51	0.34	0.45	0.69	0.80	0.75
.10	1.15	.61	−.15	.46	.31	.46	.47	.62	.68
.20	1.12	.59	−.19	.40	.28	.47	.24	.43	.60
.30	1.10	.58	−.23	.35	.25	.48	.02	.25	.52
.40	1.07	.57	−.27	.29	.22	.49	−.21	.07	.44
.50	1.05	.55	−.31	.24	.19	.51	−.43	−.12	.36
.60	1.02	.54	−.35	.19	.16	.52	−.65	−.30	.29
.70	1.00	.53	−.39	.13	.13	.53	−.88	−.48	.21
.80	.97	.51	−.44	.08	.11	.54	−1.10	−.67	.13
.90	.95	.50	−.48	.02	.08	.55	−1.33	−.85	.05
1.00	.92	.49	−.52	−.03	.05	.57	−1.55	−1.03	−.02

CASE 2—GOVERNMENT EXPENDITURES REDUCED BY THE COST OF THE CREDIT

(LB/L)	(L)	(Q)	(P)	(Y)	(W)	(W/P)	(Π)	(Π/P)	(DEF)
0.00	0.75	0.40	−0.79	−0.40	−0.15	0.65	−0.53	0.26	0.10
.10	.77	.41	−.76	−.36	−.13	.64	−.63	.13	.08
.20	.78	.41	−.74	−.32	−.11	.63	−.74	.00	.07
.30	.80	.42	−.71	−.29	−.09	.62	−.84	−.13	.06
.40	.82	.43	−.68	−.25	−.07	.61	−.94	−.26	.05
.50	.84	.44	−.65	−.21	−.05	.61	−1.04	−.39	.04
.60	.85	.45	−.63	−.18	−.03	.60	−1.14	−.52	.02
.70	.87	.46	−.60	−.14	−.01	.59	−1.24	−.64	.01
.80	.89	.47	−.57	−.10	.01	.58	−1.35	−.77	.00
.90	.90	.48	−.55	−.07	.03	.57	−1.45	−.90	−.01
1.00	.92	.49	−.52	−.03	.05	.57	−1.55	−1.03	−.02

CASE 3—GOVERNMENT EXPENDITURES UNCHANGED WITH PERSONAL INCOME TAXES INCREASE TO COVER THE COST OF THE CREDIT

(LB/L)	(L)	(Q)	(P)	(Y)	(W)	(W/P)	(Π)	(Π/P)	(t)
0.00	0.46	0.24	−1.25	−1.01	−0.47	0.78	−2.87	−1.61	1.26
.10	.51	.27	−1.17	−.90	−.41	.76	−2.72	−1.55	1.15
.20	.57	.30	−1.09	−.79	−.36	.73	−2.57	−1.48	1.04
.30	.62	.33	−1.01	−.68	−.30	.71	−2.42	−1.41	.93
.40	.67	.35	−.92	−.57	−.24	.68	−2.27	−1.34	.82
.50	.72	.38	−.84	−.46	−.18	.66	−2.12	−1.28	.71
.60	.77	.41	−.76	−.35	−.12	.64	−1.97	−1.21	.60
.70	.82	.43	−.68	−.24	−.06	.61	−1.82	−1.14	.49
.80	.87	.46	−.59	−.13	−.01	.59	−1.67	−1.08	.38
.90	.92	.49	−.51	−.02	.05	.56	−1.52	−1.01	.27
1.00	.98	.52	−.43	.09	.11	.54	−1.57	−.94	.16

In conclusion, the calculations show that if the credit is enacted when other forces (Government or not) are expanding aggregate demand, the equilibrium GNP can rise moderately without inflation. The growing GNP will increase wages and profits as well as employment and output, and the cost to the Government will be slight.

2.4. COMPARISON OF VBEC WITH OTHER PROGRAMS

A. *Personal Income Taxes*

A reduction in personal income tax rates is widely considered to be a useful strategy for stimulating employment and real output during slack periods of business activity. A cut in the personal income tax

rate will increase consumption expenditure, and therefore stimulate aggregate demand.[7] The increase in aggregate demand, and more specifically aggregate prices, leads to higher wages, employment, and real output. Through the multiplier process, larger income leads to higher levels of aggregate demand and further growth in employment. The entire scenario depends upon the initial increase in prices required to stimulate labor demand.[8] Labor supply and productive capacity are presumed to be sufficiently flexible to accommodate these increases in demand.

These are familiar results of standard aggregate analysis, and they describe a major disadvantage of a reduction in personal taxes as compared to an increase in the employment tax credit rate under similar economic conditions. With a VBEC, it is possible to directly expand employment and real output without first stimulating an increase in aggregate demand and prices. Thus, employment tax credit programs possess desirable features especially for those periods, now commonly experienced by advanced industrial nations, when prices and unemployment are concurrently rising.

A supposed disadvantage of the VBEC, as compared to personal income taxes, is that employment credits will cause distortions in interfactor allocation of resources, favoring the hiring of workers over capital. Thus, employment credits will presumably be less neutral than personal income taxes with respect to their relative impact on the allocation of resources.[9] In our opinion, the temporary nature of a VBEC will stimulate intertemporal reallocation of employment, rather than permanent substitution of labor for capital. The subsidy will encourage firms to maintain employment and possibly add to their work forces during slack periods. When the economy expands, the base can be increased and eventually the credit eliminated.

B. *Payroll Taxes*

If there is any merit to an argument that selective taxes and credits effect the long-term allocation of resources, it surely applies more to payroll taxes which add over $100 billion annually to the cost of labor. In the short run, however, an increase in payroll taxes is analytically similar to a reduction in the VBEC. Both actions will increase the cost of labor and contribute to downward pressure on employment.

Our model predicts that the currently proposed policy of increasing payroll taxes, while simultaneously reducing personal income tax rates, will precipitate a decline in employment *and* an increase in the price level. Basically, this proposal is the exact opposite of the numerical calculation presented as Case 3. Given a reduction in the income tax rate with a negative VBEC (that is, an increase in payroll taxes), the signs in Case 3 will all be reversed.

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[7] In our model, personal income taxes directly affect disposable income and government revenue; they do not directly affect either labor demand or labor supply. See the appendix.
[8] In a purely classical labor market, changes in the level of aggregate demand would have no effect on employment and real output.
[9] This argument has been offered in a recent Council of Economic Advisor's report which is critical of job credit programs.

A short-run increase in labor costs resulting from higher payroll taxes will encourage a reduction in the demand for labor. The stimulus to aggregate demand provided by lower personal income taxes may not be sufficient to offset the payroll tax promoted decline in employment, and will contribute to rising prices. Thus, a Government program intended to stimulate employment while simultaneously increasing payroll taxes may instead contribute to unemployment and rising prices. At the very least, the Government should consider the timing of payroll tax changes and attempt to avoid increasing social security and unemployment contribution taxes during periods of declining economic activity.[10] We will say more about payroll taxes in section 3.3.

C. *Investment Tax Credit*

The investment tax credit reduces the price of capital goods and thereby stimulates gross investment. Thus, an investment tax credit seems to offer the same countercyclical advantages as the VBEC.[11] Compared to a VBEC, however, there are major drawbacks to using an investment tax credit as a short-run stabilization tool.

The critical parameters for assessing the effects of credit policy on capital and employment are price elasticities of demand and supply for labor and capital, and the rates at which the use of these inputs can be expected to change in response to changes in input costs. (Picou and Waud.) Empirical evidence reveals that while price elasticities of demand for labor and capital are of roughly similar magnitude, rates of input adjustments are not. In particular, capital adjusts to changes in relative prices, or to changes in output, at a much slower rate that does employment [12] (Rosen and Nadiri, Hickman and Coen, Picou and Waud.)

Therefore, the response by firms to a VBEC will be more rapid and more complete than their response to an equivalent investment tax credit. For example, it has been estimated that only 50 percent of a once-for-all change in the relative price of capital will be absorbed after five years; in contrast, nearly 80 percent of the adjustment between actual and desired labor will be accounted for in the first year.[13] Thus, the immediate impact of the VBEC on real output is probably high, while the immediate impact of the investment tax credit is slight.

An employment tax credit will stimulate many areas of the economy where investment tax credits have little or no effect. For example, such labor intensive industries as services, wholesale and retail trade have relatively small capital stock but employ twice as many as the goods-producing sectors.

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[10] The pro-cyclical aspects of unemployment taxes are well-known. This tax, however, is a small and declining portion of the wage bill while the relative importance of social security taxes is accelerating.

[11] Theoretical support for selective investment tax credits and accelerated depreciation was provided by Robert Hall and Dale Jorgenson; and their work, which relies on neoclassical theory of capital accumulation, remains with only minor modification the basic justification. See Hall and Jorgenson.

[12] In our model, we assume that capital stock is fixed and that investment has no immediate impact on aggregate supply. Thus, the only current effect that an increase in the investment tax credit has in the model is to increase aggregate demand. Even this impact will be mitigated if the government reduces purchases as a way to finance the credit.

[13] Coen and Hickman (table 5, p. 297).

Many proponents of investment tax credits defend them not as a short-run fiscal tool, but for their growth implications; however, in an era when economists and conservationists are questioning the long-term emphasis on capital and resource-using technologies, public policy aimed at increasing capital stock rather than directly stimulating employment may be misguided. We recognize the need for new capital for economic growth. Permanent investment tax credits, accelerated depreciation schemes, depletion allowances, as well as continued increases in payroll taxes (the fastest growing source of Federal revenue), act in the long run to encourage increases in the capital/labor ratio. Recent empirical evidence reveals the elasticity of substitution between capital and production labor, and between energy resources and labor to be significantly positive. As an economy develops it will continue to try and reduce the cost of its most expensive inputs; therefore, a policy to stimulate only investment may contribute to lower long-run employment as firms substitute toward capital-intensive (and energy-using) techniques of production.

3. THE MICROECONOMIC EFFECTS OF AN EMPLOYMENT TAX CREDIT

3.1. INTRODUCTION

The primary purpose of an employment tax credit is to stabilize and expand employment by encouraging firms to retain present employees and to hire additional workers. Therefore, determination of labor demand and supply conditions is important in predicting the impact of a VBEC. In developing the aggregate model in section 2, some specific assumptions are made about the behavior of aggregate demand and supply of labor as well as the prescribed employment base. In section 3.2, the implications of these assumptions are examined at the level of the individual firm. In section 3.3, we discuss two commonly cited aspects of labor markets which are not directly incorporated in our aggregate model. The first of these concerns the impact of the VBEC on the length of the workweek. The second involves the effects of a VBEC when there is labor hoarding; that is, when labor is treated as a quasi-fixed input possessing attributes similar to those of capital. Finally, section 3.4 addresses the question of administration and scope of the credit.

3.2. THE RESPONSE OF THE INDIVIDUAL FIRM TO A VBEC

Under competitive conditions, the quantity of labor demanded by a business firm is determined by wages, other labor costs, and the value of the product labor produces. A reduction in the price of labor, ceteris paribus, increases the quantity of labor demanded as long as the net contribution to profit of the additional employment is positive.

This is illustrated in figure 3.1. The short-run equilibrium level of employment, L_1, is determined where the market wage rate, W, equals the demand for labor, D_1.[1] At this point, the cost of an additional worker, W, just equals that marginal worker's contribution to the value of the firm's product.

Introduction of a VBEC can encourage the individual firm to maintain or even increase employment when there is a decline in the demand for labor. For example, if the price of output falls, then the value of each worker's output is lower at all wage rates (the demand for labor declines to D_2). Under these conditions, employment is ordinarily reduced to L_2. If the firm receives a credit on the wage rate, however, employment need not decline. If the credit reduces

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[1] The demand curve for labor, known as the value of the marginal product of labor, is found by multiplying the price of the firm's product by the incremental output contribution of each worker. Short-run demand for labor is presumed to be downward sloping because of diminishing incremental returns to labor.
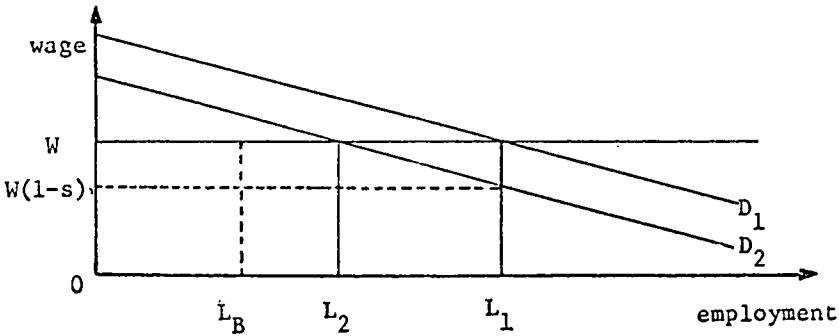
FIGURE 3.1

the wage rate paid by the firm by s percent of the wage (to $W(1-s)$), then employment remains at L_1, rather than declining to L_2. Larger credits will induce employment increases beyond L_1.

It is not necessary to credit the wages of all workers in order to maintain employment at L_1. In particular, whether the firm can be induced to continue employment at L_1 depends on the prescribed base of the program, L_B. For all bases from zero to L_2, $(0 > L_1 > L_2)$, the credit will be accepted and employment will remain at L_1. This follows because for employment rates from zero to L_B, the firm pays W, which is below the value of labor's marginal product. Once L_B is reached, the effective cost of labor drops to $W(1-s)$, and employment will continue to be profitable until L_1 is reached.

If the base is greater than L_2, however, the credit may or may not be accepted. As seen in figure 3.2, for $L_B > L_2$, the wage of $L_B - L_2$ workers will exceed the value of these workers' contribution to output, by Area I. The question then becomes whether or not this loss in profit is offset by the gain attributable to the employment of credit-subsidized workers.

The maximum base under which the firm will accept the credit, and still be willing to hire L_1 workers, is where the profit lost by paying $L_B - L_2$ workers a wage which exceeds the value of their added product is just equal to the gain in profit attributable to employment $L_1 - L_B$. If area I equals area II, then L_B is that base.
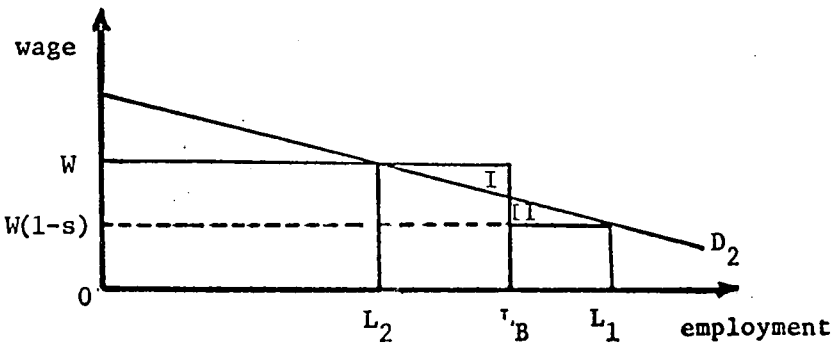

FIGURE 3.2

A parallel analysis applies in determining the number of additional workers a firm will hire when a credit is introduced without there first being a decline in labor demand. For example, in figure 3.2, if current employment is L_2, the firm would hire $L_1 - L_2$ additional workers if a VBEC is introduced with base L_B and credit rate of s percent of the wage.

Thus far the analysis has been confined to the response of an individual competitive firm which perceives the supply of labor as being infinitely elastic. With over 7 percent of the work force currently unemployed, it is tempting to assume that the general level of wages will not have to rise to prompt an increase in the quantity of labor supplied.

The short-run aggregate supply of labor, however, is unlikely to be perfectly elastic. This follows because labor markets are heterogeneous, job information is imperfect, and the opportunity cost of entering the work force is the loss of transfer payment. Empirical evidence suggests that short-run elasticities of labor supply, while appreciably higher than long-run elasticities, are finite. Estimates made by Lucas and Rapping, for example, indicate that a 1 percent increase in the real wage will increase the quantity supplied of labor from 1.7 to 4 percent. Therefore, if the VBEC increases aggregate demand for labor, the wage rate must rise if employment is to increase. The increase in the tax credit rate required to achieve a specified increase in employment will be larger than for the infinitely elastic case and will depend, as it did in the macroeconomic model, on elasticities of supply and demand for labor. In general, the more inelastic labor demand and supply, the greater must be the credit to achieve a given increment in employment.

3.3. THE RELATIONSHIP BETWEEN A VBEC AND THE LENGTH OF THE WORKWEEK

The labor market analysis presented in previous sections presumes a direct, constant relationship between employment (number of workers) and man-hours of labor services. Man-hours, however, are the productive input which firms hire to produce goods and services and are the conceptually correct measure of labor services. A definition of man-hours is: man-hours equals utilization multiplied by employment, where utilization is measured as hours per day (week) and employment is measured as number of workers.[2] Given constant utilization (for example, an 8-hour workday), an increase in the number of workers directly translates into higher man-hours and greater real output. Whenever it is possible for firms to substitute hours worked for employment, this simple, direct link no longer holds. Specifically, man-hours will decrease if utilization falls and employment stays constant; thus, there are different combinations of employment and utilization which equal the same number of man-hours. For example, 80 employees working 7 hours per day yield the same man-hours as 70 employees working an 8-hour day. While man-hours in the above cases are identical, 560, employment is 10 workers greater in the first situation.

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[2] Technically, manhours is a flow of labor services and employment is a stock. Utilization transforms the stock variable into a flow.

In terms of capacity of the economy, the conceptually preferred definition of unemployment is also a flow of man-hours of labor services equal to the difference between man-hours offered (supplied) and man-hours actually worked (demanded). Reported unemployment statistics, however, present a stock of workers rather than a flow of man-hours. Unemployment, as reported by the Bureau of Labor Statistics, is the difference between those who are offering labor services and those who are actually selling some positive amount of labor services. Specifically, a person who is willing to work more hours at a given wage than firms are willing to purchase at that wage is unemployed by the above definition; yet this unemployment is not reported in unemployment statistics.

During periods of declining business activity, many firms initially reduce the number of hours worked per day per worker. Only after this adjustment in utilization has been made are firms likely to begin to lay off workers. Consequently, unemployment as a flow of man-hours, will rise more quickly during contractions and fall more quickly during expansions of business activity than reported unemployment. There is substantial empirical support for this proposition. For example, Rosen and Nadiri (p. 268) report that "* * * patterns of adjustment indicate that utilization rates are truly variable inputs and that there is a hierarchy of adjustment speeds among stocks, ranging from fairly rapid adjustment of production employment to rather slow adjustment of capital stock."

Even after short-run utilization adjustments have been made during a recession, firms may retain currently unproductive workers. This behavior can be explained by the existence of certain nonwage related labor costs which are associated with changing the level of employment. The willingness of firms to hoard labor, that is, to maintain the level of employment even though these workers are not producing real output, depends upon the hourly wage, and nonwage costs of hiring, training, and firing (Clark). In general, the higher the ratio of nonwage costs to wage costs, the longer it is profitable for firms to hold nonproductive labor.[3]

Given this brief discussion of the relationship between man-hours, utilization, and employment, what are the implications for a VBEC? The answers depend, in part, on the policy objectives of the program. If the purpose of the credit is to reduce the reported rate of unemployment, it is possible to do this without increasing, and possibly decreasing, man-hours worked. If the purpose is to maintain or expand man-hours, this conceivably could be accomplished without large, initial effects on the number of unemployed workers.

If a credit is offered as some amount per eligible worker, firms may hire additional workers and reduce the length of the workday. That is, firms might replace full-time with part-time workers, and thereby receive tax credit even when man-hours and real output are falling. Here, an employment tax credit will simply encourage substitution of the eligible component of man-hours for the ineligible. Also, part

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[3] Extensive literature is developing which treats employment as a quasi-fixed input and attempts to explain the apparent "labor hoarding" that occurs during contractions of business activity; see Oi, Tinsley, and Clark. Under a rather restrictive set of production conditions, Clark derives the maximum length of time that it is profitable for a firm to keep a worker on the payroll without having him work as t^* equals h plus f divided by W, where h is hiring cost, f is layoff cost, and W is the wage rate. In this formulation, a reduction of wages will increase the length of time a firm will hoard labor.

of the program's cost will fall on employed workers who are forced to take a reduction in hours worked. While it is unlikely that unions will tolerate significant reductions in the workweek which penalize established members and reward newer workers, this phenomenon might develop in less organized sectors where the credit is likely to have the largest impact.

If the credit is offered as *some percentage of the hourly wage*, as we propose, it is possible that a firm will increase man-hours by raising utilization for its current work force. Here, even if employment does not change, there is an actual increase in labor services. Furthermore, as employed workers begin to work the normal hours per week, the number of employed will be gradually adjusted upward.[4] Specifically, firms begin to hire only when there is upward pressure on utilization. As utilization begins to approach the normal rate, employment will typically increase since further efforts to expand utilization will entail increases in the hourly wage.

Legislative proposals sometimes suggest offering a credit on the hourly wage of eligible workers for a normal length workday. While this approach may avoid some abuses, for example, substitution of full with part-time employees, it also reduces a firm's ability to shorten the workday while maintaining employment, or at least to substitute utilization decreases for decreases in employment. A VBEC that credits the hourly wage permits firms to decide for themselves the appropriate mix between utilization and employment. Also, a percentage reduction of the wage rate will not distort the pattern of expenditure between unskilled and skilled workers, in contrast to a credit paid on each eligible worker.

3.4. ADMINISTRATION OF A VBEC

The most efficient way to administer an employment credit program is through the existing payroll tax system. As previously discussed, an increase in a VBEC, which offers a percentage reduction on the hourly wage, is identical to a short-run reduction in payroll taxes. Thus, the most comprehensive way to administer a VBEC is to provide employers a rebate against payroll tax liability. In effect, payroll taxes are thereby adjusted to stabilize employment and output, that is, they take on a countercyclical fiscal role. For political and psychological reasons, the rebate can be called an "employment tax credit," and the bookkeeping can be separately kept from social security contributions.

Payroll tax rebates are preferable to providing a credit against corporate profit tax liability since many firms have zero or insignificant taxable income during periods of declining business activity, and those are the periods when the VBEC is most needed. While a credit against corporate profits can be deferred, it is easier and more immediate to reduce payroll taxes which must be paid regardless of business conditions.

Another advantage of attaching the credit to the payroll tax structure is the possibility of extending the coverage to encompass employment

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[4] For a complete, conceptual discussion of possible relationships between utilization and employment, see Grossman.

in nonprofit organizations and possibly State and local governments. These institutions employ a growing percentage of the labor force and presumably would respond to a wage bill subsidy in the same manner as profit-motivated businesses. For State and local governments, the subsidy against their wage bill can be considered a cheaper and more efficient alternative to public service employment.

4. SUMMARY AND CONCLUSION

The purpose of this paper has been to examine policy implications of a universally applied employment tax credit. The program is intended to be a short-term supplement to existing fiscal and monetary policy tools. The basic rationale of the program is to reduce the cost of labor to business firms and thereby initiate an increase in the utilization of labor. Presumably, the credit will be instituted during periods of declining business activity, and during periods when actual employment is below potential employment. The major conclusions in this investigation are:

(1) In the context of a standard multiequation macroeconomic framework, our analysis and numerical calculations indicate that a variable base employment tax credit will increase employment and real output without necessarily increasing the aggregate level of prices.

(2) In contrast to reductions in personal and corporate income taxes, which act to expand aggregate demand and thereby aggregate prices, a universal employment credit will increase both aggregate demand and aggregate supply. Thus, under a variety of financing strategies, the employment tax credit will have a dual impact on employment and output, expanding both supply and demand. This dual impact will typically help to mitigate price rises usually associated with an expansionary fiscal program.

(3) Much of the criticism of employment tax credit policy is predicated on the assertion that short-run labor demand relationships are not responsive to the price of labor services. We offer the following response to this argument. There is not a body of empirical evidence which points to zero price elasticities of demand for labor in the short run. Even in the more capital intensive sectors of the economy such as manufacturing, empirical evidence indicates that while price elasticities of demand for labor are low, they are not zero (Coen and Hickman, Rosen and Nadiri, Tinsley and Berndt, Kesselman and Williamson). Also, given the general pattern of rising wages and employment experienced in the United States during the postwar period, it is unlikely that price elasticities of demand can even be identified statistically. Further, there are no reasons to believe, either conceptually or empirically, that demand for labor is not responsive to changes in price in the more labor intensive sectors of the economy where over half the U.S. work force is employed.

(4) Another criticism of employment tax credit policy is that it will provide windfall profits to business firms, particularly during the expansion phase of business activity when firms are intending to increase their utilization and hiring rates anyway. There are three responses to this criticism. First, a variable base program calls for adjustment of the credit base to accommodate changing business conditions. The base can be decreased during declining periods of

business activity, and can be sharply increased during expanding phases. Adjustment of the base requires careful administration, but will reduce the likelihood of windfall profits. Second, the full effect on profits is a macroeconomic as well as a microeconomic phenomenon. In all numerical calculations on the macroeconomic model, labor income always increases in response to the credit; profits increase only when the credit base is quite low, and only then under the more expansionary forms of government financing strategies. Finally, base adjustment of the program appears to be an easy, immediate, and effective method of changing the level of aggregate demand in the economy. The program deserves consideration on this basis alone.

(5) Both employment and investment tax credits are intended to encourage intertemporal substitution of inputs rather than permanent substitution of one input for the other, that is, the credits are intended to encourage firms to increase current levels of employment and investment. There is considerable empirical evidence, however, that employment tax credits will be more effective in this regard than investment tax credits. In particular, employment adjusts to changes in prices at a much faster rate than capital, and this characteristic of employment will improve the performance of the employment tax credit as a short-run policy measure. Also, employment credits may stimulate employment of low income, marginally skilled workers who make up a disproportionate share of the unemployed. It will also stimulate employment in many areas of the economy where investment tax credits have little direct impact.

(6) The cost to the Government of an employment tax credit will depend on labor market characteristics, the credit base, and the method selected to finance the credit. A number of our calculations, which use current U.S. tax parameters, reveals declines in the Government deficit in response to a ceteris paribus increase in the credit, that is, the credit-induced expansion of tax receipts and contraction of unemployment benefits more than offset the loss in tax revenue attributed to the program.

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APPENDIX

We present here the aggregate model used for our analysis. There are 16 equations which include 6 identities, 8 behavioral equations, and two equilibrium conditions. There are five parameters and nine qualitative restrictions. The endogenous variables are:

Y = GNP or aggregate demand,
C = consumption expenditures,
I = gross investment,
G = government expenditures,
P = aggregate price level,
Q = real output (real GNP),
Y_p = personal income,
Y_d = disposable income,
W = money wage,
L = actual work force,
L_u = unemployed work force,
Π = profit,
R = net government receipts,
D = deficit $(+)$, or surplus $(-)$,
i = interest rate, and
M_D = demand for money.

The exogenous variables are:

G_o = exogenous government expenditures,
L_l = full-employment work force,
L_B = base employment work force,
M_s = supply of money, and
K_o = initial capital stock.
T = profit tax rate,

The parameters include:

T = personal income tax rate,
k = investment tax credit rate,
s = employment tax credit rate, and
b = unemployment benefit, per worker.

Given these definitions, the model contains the following identities and behavioral equations.

(a) Accounting Identities:
(1) $Y = C + I + G$
(2) $Y_p = WL + (1-T)w + Ws(L-L_B) + kI$
(3) $Y_d = (1-t)Y + bL_u$
(4) $\Pi = PQ - WL - I$
(5) $R = tY_P + T\Pi - Ws(L-L_B) - kI$
(6) $D = G + bL_\mu - R$

(b) Aggregate Demand Equations:
(7) $C = C(Y_d)$
(8) $I = I(i,k)$
(9a) $G = G_o$
(9b) $G = G_o - Ws(L-L_B)$

(c) Aggregate Supply Equations:
(10) $Q = F(L,K_o)$
(11) $W(1-s) = PF_L$
(12) $L = L(W,P)$
(13) $L_u = L_F - L$

(d) Money Market Equation:
(14) $M_D = M(Y,i)$

(e) Equilibrium Equations
(15) $M_D = M_s$
(16) $Y = PQ$

Conventional assumptions are made regarding qualitative properties of the model. These are: the marginal propensity to consume disposable income is greater than zero and less than one; investment is a decreasing function of the interest rate and an increasing function of the investment tax credit rate; the marginal product of labor is positive and decreasing; labor supply increases

with respect to the money wage and decreases with respect to the price level; and demand for money increases with respect to GNP and decreases with respect to the rate of interest. The condition can be summarized as (subscripts indicate partial derivatives):

$$0 < C^{\circ}_{Yd} < 1,\ I_i < 0,\ I_k > 0,\ F_L > 0,\ F_{LL} < 0,\ L_w > 0,\ L_p L 0,\ M_y > 0,\ M_i < 0.$$

The first six statements in the model are identities which define aggregate demand, personal income, disposable income, taxable profit, tax receipts and government expenditures, respectively. Several explanatory comments are necessary. Personal income, Equation 2, is wage income plus after-tax business profits, where after-tax profits include employment and investment tax credits. Employment tax credits, $Ws(L-L_B)$, are granted on that portion of the wage bill which exceeds the prescribed base. An across-the-board credit on the entire work force occurs when $L_B = 0$; and a credit on new workers only occurs when $L_B = L$. The latter is termed a marginal employment tax credit. Intermediate cases occur with $0 \leq L_B/L \leq 1$. Disposable income, Equation 3, contains unemployment compensation, a transfer payment dependent on the difference between the exogenously defined full employment work force and the actual work force. Tax revenue, Equation 5, is personal and business income taxes net of employment and investment tax credits. Equation 6 defines the deficit (or surplus) as government expenditures plus transfers minus tax revenues.

Equations 7, 8, and 9 specify consumption, investment, and government expenditures. Consumption varies with disposable income, while investment is assumed to respond to the interest rate and the investment tax credit. Two alternatives are offered as possibilities for explaining the behavior of government expenditure. The first, Equation 9a, assumes government expenditures are set independently of the credit. The second representation, Equation 9b, has government expenditures reduced by the loss in tax revenue associated with the credit. A third possibility, which is not listed but which receives some attention in Section 2.3, is to have income taxes adjusting upward to offset the cost of the employment tax credit.

Equation 10 postulates real output as a function of variable labor and initial capital stock. With capital fixed in the short-run production function, gross investment has no immediate impact on real output.[1] Labor demand, Equation 11, presumes competition in the labor market, diminishing marginal productivity of labor (F_L), and includes the employment tax credit rate as a "shift" parameter: an increase in the credit rate increases labor demand for all eligible workers.[2] Labor supply, Equation 12, depends on the money wage and the price level. Labor supply can be varied to take into account the relative awareness workers have concerning the impact of prices on purchasing power.[3] If workers are completely unaware of the impact of changing prices, they have "money illusion." If, however, employment decisions are made on the basis of real purchasing power, then aggregate prices are just as important as money wages in affecting labor supply.

Demand for money, Equation 14, depends on the level of income and the interest rate. Equations 15 and 16 are equilibrium conditions. Demand equals the exogenously determined supply of money, and the value of real output equals GNP.

The variable base employment credit (VBEC) has a direct effect on several key variables in the model, and these direct effects can readily be stated. First, in Equation 11, an increase in the credit will reduce the wage cost to the firm for eligible workers and thereby initiate an increase in labor demand. Second, in Equation 2, an increase in the credit increases the after-tax-profits component of personal income and therefore consumption. Finally, in Equation 5, the credit reduces government revenue; and if Equation 9b is used, the credit also reduces government expenditure. While it is possible to postulate these direct effects, the complete response of these and other variables in the economy to an increase in a VBEC depends on the full interaction of labor, commodity, and financial markets.

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[1] This seems to be a plausible and empirically defensible short-run assumption. The implication of this particular formulation will be considered when the investment tax credit is compared with an employment tax credit in Section 2.4.

[2] The likely impact of a wage reduction on short-run demand for labor is the most controversial aspect of the program. Needless to say, if labor demand is unresponsive to changes in the wage rate, an employment credit would have no effect. The response of the firm to the credit is considered by Berndt, Kesselman, and Williamson (1975). We discuss this question in Section 3.

[3] More specifically, the labor supply function has the property $\theta p = L_w w + L_p P$. Classical supply occurs when $\theta = 0$, which implies $L_w w = -L_p P$. In this case, the supply of labor is determined by the real wage. In contrast, a complete "money illusion" occurs when $\theta = L_w$, which implies $L_p = 0$. In this case, workers ignore the effects that aggregate prices have on purchasing power and vary their offer of labor services only in response to changes in the money wage. Intermediate cases occur for $0 < \theta < L_w$.

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