Evaluating the Effects of the Employment Tax Credit of 1977

by

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Evaluating the Effects of the Employment Tax Credit

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The irony of the complicated new Employment Tax Credit (ETC) is that it is part of the Tax Reduction and Simplification Act of 1977. The relatively simple idea of providing a tax credit against business income of 50 percent of wages paid for incremental employment is not so simple after all judging from the eleven pages of boiler plate in the Act required to close all the loopholes. Since fiscal stimulus in the form of an ETC is a relatively novel effort, it is important to know what might be expected from the particular tax-subsidy actually embodied in the 1977 Act. To do this I first set out in simplified form the accounting details of how the ETC is designed to operate in terms of the change in the wage rate it may be expected to induce. This is followed by a discussion of the microeconomic behavioral changes that might be expected to result from the ETC and how these might be evaluated. I conclude with a brief discussion of how the microeconomic issues raised by an ETC mesh with the macroeconomic issues that must also be addressed in order to properly evaluate it. The algebra behind some of the argument in the text is contained in an appendix for those who may find it useful.

What Is the Employment Tax Credit?

The ETC is a form of marginal employment subsidy that operates through a business tax credit. In principle it offers a deduction from taxes of

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fifty percent of the amount by which wages paid this year exceed 102 percent of wages paid last year. The tax credit is not refundable, however, so that an employer's actual tax liability sets an effective upper limit on the size of the tax credit. Moreover, to avoid the possibility that employers (partnerships) in high tax brackets might pay a net wage that is negative when the sum of the tax credit rate and the tax rate exceeds 100 percent, the amount of the allowable tax credit must be subtracted from the wages deducted in the process of calculating taxable income. In principle, the result of this is to produce a reduction in the wage rate of full-time incremental workers of exactly fifty percent.

In practice, the ETC differs considerably from the deliberately simplified description I've given of it to this point. First, the subsidy rate of fifty percent implied by the tax credit varies with the wage rate an employer pays. This happens because the tax credit may only be taken on those wages paid that are subject to federal unemployment tax payments. At present only the first $4,200 of annual wages are subject to federal unemployment taxes, so the effective wage subsidy of fifty percent applies only to those firms whose annual average wage payment for incremental workers is less than or equal to $4,200. For employers whose annual wage payments to incremental workers are greater than $4,200 the effective wage subsidy rate may be considerably smaller than 50 percent. For example, an employer that makes an annual average incremental wage payment of $6,400 faces an implicit wage subsidy of 25 percent, while an employer that pays an average of $12,600 to incremental workers faces a wage subsidy of only 17 percent.

On the other hand, in the absence of some additional constraint the use of the wage base subject to federal unemployment taxes clearly provides an incentive to replace full-time with part-time workers. To eliminate this
possibility the tax credit may be no larger than the excess of the given year's total wages over 105 percent of the previous year's total wages. Although this makes it unprofitable to replace full-time workers with part-time workers within the employment base it does not remove the obvious incentive to substitute part-time for full-time workers amongst incremental employment.

Second, the total amount of the tax credit is limited. On the one hand, the total tax credit may not exceed $100,000. This is the effective limit for large firms, but there is also an effective limit for small employers. In particular, the tax credit may not exceed 25 percent of the given year's total wages subject to federal unemployment tax payments. The result of these two rules is that for employers whose workers receive annual payments of $4200 or more there is a simple rule limiting the additional employment that is subsidized. This "maximum subsidizable employment growth ratio" varies with employer size as is illustrated in Table 1 for three firms with different levels of employment in the previous year. For very large firms the additional subsidized employment is a very small fraction of total employment and it is hard to imagine such firms paying much attention to the tax credit. For small firms, however, as Table 1 indicates employment may double before the incremental subsidy vanishes.

Finally, the ETC applies only to tax years 1977 and 1978. Since the base year over which employment must expand in order to receive a tax credit moves forward with each new tax year this means that the ETC is received only in the year that new employees are hired. This feature of the ETC has two effects. First, an employer may reduce employment for the 1977 tax year and receive a tax credit by re-hiring these workers for the subsequent tax year.
<table>
<thead>
<tr>
<th>Size of Firm in Base Year</th>
<th>Number of Additional Employees</th>
<th>Maximum Subsidizable Employment Growth Ratio ($E^*/E_o$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>2.040</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>1.496</td>
</tr>
<tr>
<td>1,000</td>
<td>67</td>
<td>1.0676</td>
</tr>
</tbody>
</table>
Thus, two different employers might have average employment levels over the 1977 and 1978 tax years that were identical, but an employer with stable employment would receive no tax credit while the employer that first reduced and then increased total employment would receive a tax credit. Second, this provision of the ETC provides an incentive to expand employment in the 1977 and/or 1978 tax years, but it provides no continuing incentive to maintain these new employment levels. The moving employment base against which employment must be compared in order to receive the ETC makes this an inevitable feature of the ETC format.

There is another provision of the ETC with which I have not dealt here, and that is a special uncapped additional 10 percent credit for hiring certain handicapped workers. Such handicapped workers must, in general, be referred through government vocational rehabilitation programs, and it is unlikely that this could add significantly to aggregate employment. On the other hand, because the implicit wage subsidy to such handicapped workers is larger than for other workers and is also unlimited it may be worth examining the effectiveness of this aspect of the Act in further research.

The Microeconomics of the Employment Tax Credit

The ETC produces two changes in an employer's environment. For some employers it represents a decrease in the wage costs of marginal employees and a decrease in taxes, while for others it represents merely a decrease in taxes. To analyze these two cases it is useful to distinguish three categories of employer on the basis of the employment growth that would be chosen by the employer in the absence of the ETC.
First, there are those employers for whom planned growth in employment in the absence of the ETC would be greater than the employment growth that will be subsidized under the ETC. These are the employers that would receive the maximum tax credit in any case because their planned employment growth in the absence of the ETC was greater than the maximum subsidizable employment growth. Examples of this maximum subsidizable growth for various sizes of employer are contained in Table 1 under some simplifying assumptions. For very large firms even a planned growth rate of only slightly larger than 2 percent is sufficient to remove the marginal subsidy to employment. These employers need not change their behavior from what it would otherwise have been in order to receive their maximum allowable tax credit. Consequently, these employers do not behave as if the marginal wage they face had changed and merely receive a lump sum or windfall tax credit without changing their planned behavior. No incremental employment is generated by the ETC among such employers, but they do receive greater after tax income.

Second, there are those firms whose planned employment growth in the absence of the ETC falls above some lower limit so that it is profitable to increase employment enough to take advantage of the ETC. Clearly, any firm whose planned employment growth rate in the absence of the ETC falls between 2 percent and the maximum subsidizable employment growth rate is in this category. However, some firms with planned employment growth rates below 2 percent will also find it profitable to increase their employment growth to at least the 2 percent rate in order to take advantage of the ETC. In the appendix I show that, as an approximation, this opting-in employment growth ratio \( \tilde{E}/E_0 \) is
\[
\frac{\tilde{E}}{E_0} = 1.02/(1-0.5e^8),
\]
where \( e = (3E/3W)(W/E) \) is the (output-constant) elasticity of demand for labor and \( \theta \) is the effective decline in the wage rate for marginal workers that results from the ETC. Employers with planned employment growth ratios greater than \( \frac{\tilde{E}}{E_0} \) find it profitable to increase their employment enough to receive a tax credit while employers with lower planned employment growth ratios do not. Clearly, the opting-in employment growth ratio depends inversely on the (absolute value of) the elasticity of labor demand and the size of the effective wage subsidy. Here the elasticity of labor demand reflects the substitution of labor for other inputs only, so this implies that increased employment for the purpose of receiving a tax credit will be greater among employers where this substitution is easier and among low wage firms where \( \theta \) is greater also. This issue is illustrated in Table 2 where I have calculated values of the opting-in employment growth ratio for what Hamermesh [2] has suggested, based on a survey of the evidence, might be reasonably high, medium, and low estimates of the elasticity of demand for labor. Since the implied wage subsidy varies with the average annual wage paid by the employer I have also calculated the opting-in employment growth ratio for three different values of this wage in Table 2. Of course, a third category of employers are those whose planned growth rate falls below the opting-in employment growth rate and who receive no tax credit.

As can be seen from a comparison of Tables 1 and 2, small firms paying low wage rates where there is considerable shortrun substitutability among labor and other factor inputs are those where actual behavior is most likely to be changed as a result of correctly perceived provisions of the ETC. On
<table>
<thead>
<tr>
<th>Elasticity of Labor Demand ((e))</th>
<th>Annual Wage ($4,200)</th>
<th>Annual Wage ($8,400)</th>
<th>Annual Wage ($12,600)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.35</td>
<td>.938</td>
<td>.977</td>
<td>.991</td>
</tr>
<tr>
<td>-.15</td>
<td>.963</td>
<td>1.001</td>
<td>1.007</td>
</tr>
<tr>
<td>-.05</td>
<td>1.007</td>
<td>1.014</td>
<td>1.016</td>
</tr>
</tbody>
</table>

Table 2

Opting-in Employment Growth ~ Ratio (\(E/E_0\)) for Various Wage Levels
the other hand, actual behavior is least likely to be changed by an ETC among large firms paying relatively high wages and where short run substitution of labor for other inputs is difficult. These firms are more likely to simply receive a windfall tax credit depending upon whether their employment would grow by at least 2 percent compared to the previous year in any case. Of course, for those firms whose marginal wage is affected employment is expected to increase by the proportion \(-e\theta \) or \((E^*-E)/E\), whichever is the smaller, where \( E \) represents the employment level that would have prevailed in the absence of the ETC.

With the stage set in this way, it is interesting to consider explicit attempts to quantify the two main changes that may potentially result from the ETC. First, there are increases in after tax income generated for those who take advantage of the tax credit. This is potentially the easiest issue to examine and bears on the equity and efficiency of this particular form of fiscal stimulus. There are two important aspects of the distribution of the tax credit. First, those employers that are reducing their employment or increasing it by less than 2 percent will receive no tax credit. Since these employers are likely to be located in the most depressed and unemployment prone areas in the country it is important to have some indication of the aggregate distribution of the tax credit according to the health of the local economy in which the employer is located. If the increase in after-tax business income through the ETC is taking place mainly in the rapidly growing areas of the country where unemployment is low it may actually be exacerbating both inflationary pressures and the inequality in recovery from the recent high unemployment rates in the U.S. Unfortunately, it will not be an entirely straightforward matter to examine this issue using the Treasury records on
the location of employers receiving the tax credit because many large firms have central headquarters in locations far from their largest establishments. Thus, simply relating the locations of employment growth to the locations of central financial offices may be very misleading. The reason this analysis may nevertheless be useful on at least a limited scale is that, as we have seen, the greatest incentive for employment expansion is provided by the ETC among small firms that are likely to have a single establishment.

A related issue is the distribution of the tax credit by size of employer as measured by total assets, after tax income, and employment level. An examination of this issue bears more directly on the equity of the tax credit in terms of its incidence according to the wealth and/or size of the employers that receive it. An especially important issue here is whether the tax credit is received by small firms that may be unaware of the provisions of the ETC. Of course, it is also important to tabulate these data by employment growth rates to see whether the failure to receive the tax credit is a result of a correlation between some given factor and the uneven incidence of the employment growth taking place in the economy.

A second basic issue for evaluation is the extent to which employment has been increased above what otherwise would have been the case as a result of the ETC. There are several basic lessons to be learned about doing this from the preceding analysis. First, it is not possible to generate estimates of additional employment created by the ETC from knowledge of the size of the aggregate tax credit alone. Assuming each additional worker earns at least $4200 per year, for example, it will be nearly irresistible for some to simply divide the aggregate tax loss to the treasury by $2100 (the part financed by the Treasury) and claim that full-time employment was increased
by this quantity as a result of the ETC. As we have seen, however, even if
the elasticity of demand for labor were large in the short run, which does
not seem likely, this would tend to dramatically over-state the employment
increase resulting from the ETC if there is considerable dispersion in planned
employment growth in the absence of the ETC because many employers will receive
tax credits without changing their behavior at all.

One useful way to examine this issue would be to compare the size of
the actual employment tax credit against the allowable tax credit and the tax
credit for which the employer would have been eligible if there had been no
maximum on the allowable tax credit. For those employers that could have
taken tax credits considerably greater than the maximum allowable it is likely
that employment was not significantly affected by the ETC since these employers
probably would have expanded at the rate actually observed even in the absence
of the ETC. Of course, these calculations cannot be exact, but it would be
useful to tabulate the amount of the tax credit among (a) employers that claim
less than the allowable credit, (b) employers that claim exactly the allowable
credit, and (c) employers where actual employment increased by perhaps 5 or 10
percent more than would be required to claim the total of the allowable credit.
The greater the fraction of the employers in group (c) the less likely it will
be that the marginal wage was affected at all and the less likely that employ-
ment was increased as a result of the ETC. The greater the fraction of the
tax credit received by employers in groups (a) and (b) the greater is the chance
that employment was increased above what it would otherwise have been. Indeed,
a simple (upward biased) estimate of the increase in employment generated by
the ETC could be obtained as the division of the aggregate tax credit taken by
employers in groups (a) and (b) by $2100. This would be an upward biased
estimate of the employment effect of the ETC because some firms in groups (a) and (b) would almost certainly have been eligible for the tax credit even in the absence of any change in their behavior but it would be preferable to a similar estimate based on the aggregate tax credit for all employers. An alternative and hypothetical estimate of the increase in employment generated by the ETC could be obtained as the product of the assumed elasticity of demand for labor and the total employment in categories (a) and (b) in the previous year. These latter estimates, based on several alternative values for the labor demand elasticity, might serve as checks on the plausibility of the former estimates.

A more formal procedure for analyzing the size of employment effects generated by the ETC would be to compare an estimate of the distribution of employment growth rates in the absence of an ETC against the actual distribution of employment growth rates in its presence. One way to do this would be to estimate the distribution function of employment growth rates from data for a period prior to the enactment of the ETC. As we have observed, the effect of the ETC on employers should be to increase the proportion of employers with employment growth rates $E/E_0$ in the range $E/E_0 < E/E_0 < E/E_0$ and to increase the proportion of employers in the upper end of this range. Differences in the distribution functions of employment growth rates before and after enactment of the ETC might then serve as a basis for an estimate of the overall employment effect of the ETC.

A second lesson to be learned about the evaluation of the employment effects of the ETC results from consideration of its effects on employers that may carry inventories or where it is otherwise possible to engage in the inter-temporal substitution of labor inputs. In general, the temporary nature of
the tax credit sets up an incentive to substitute labor inputs that may be used today for labor inputs that may be used tomorrow. To the extent that employers had planned to add to their employment at a future date this will presumably speed up their recruitment today. In either case, however, the increased employment in the contemporaneous period may be at the expense of decreased employment in future periods. Thus, a complete evaluation of the effects of the ETC on employers claiming the tax credit would include not only an analysis of its effect on the 1977 and 1978 employment growth of these employers but also an analysis of their employment in subsequent periods.

A final lesson to be learned about the evaluation of the employment effects of the ETC is that simple simulations of its effects that do not account for the correlation of employment growth in the absence of the ETC with variations in the ease of substituting labor for other inputs among firms may be seriously misleading. The only case in which the average employment increase resulting from the ETC would equal the product of the average elasticity of labor demand and the average wage subsidy rate would be when all employers would have grown at the same rate in the absence of the ETC, all demand elasticities were equal, and all subsidy rates were equal. Of course, the more disaggregated the simulations the more likely it is that these conditions will be satisfied.

Macroeconomics and the Employment Tax Credit

The implicit model of the employer I have used to this point assumes that a firm wishes to minimize the costs of producing a given, fixed output. It has therefore been implicitly assumed that the ETC does not affect the output employers supply to the product market. In dealing with the employer
at the microeconomic level this assumption may be rationalized in two differ-
ent ways. First, in the very short run it may be plausible to assume that
output prices are fixed so that the ETC will not result in a competitive
downward adjustment in prices in the short run. In this case current employ-
ment expansion results only because of the substitution of labor for other
inputs or for future employment expansion and not because lower output prices
lead also to an expansion of the scale of output. A second, macroeconomic
rationale concerns the question of the equilibrium of employers with respect
to the goods market in the presence of disequilibrium in the aggregate economy.
In modern Keynesian models firms face so-called demand constraints on the out-
put they may sell in the product market at prevailing prices. In this sense
such firms are effectively rationed with respect to the sale of their products
at the microeconomic level.

In either case I have implicitly dichotomized the aggregate employment
effect of the ETC into its impact at the microeconomic level and its further
macroeconomic-impact through the feedback of an increased aggregate demand for
output. The major effect of the ETC on aggregate output demand is surely
through its effect as a general reduction in business taxes. A first round
estimate of the size of this business tax cut is the amount of the aggregate
tax credit claimed and the effects of this on aggregate demand will presumably
be independent of whether employers must change their short-run employment to
obtain the tax credit or not. Thus, the microeconomic feedback and other
multiplier effects of the ETC will work through its impact on total business
taxes and the subsequent effects this may have on aggregate demand. The size
of these macroeconomic effects will no doubt depend on the particular macro-
economic model analyzed, but this analysis is no more nor less difficult than
the analysis of other fiscal policies. The unusual characteristic of the ETC
compared to other fiscal policies is the impact that it may have on marginal wage costs and it is on these effects that I have focused. Implicitly, therefore, I have contrasted the possible employment effects that an ETC might generate in comparison to a general business tax cut of comparable size. A complete aggregate evaluation must therefore couple the analyses above with the analysis of the macroeconomic effect of a general business tax cut on aggregate output and employment.\textsuperscript{1/}

\textsuperscript{1/} An analysis of a marginal wage subsidy in a simple macroeconomic model of an open economy is contained in Layard and Nickell [5], for example.
APPENDIX

In this appendix I first spell out the algebra of how the parameters of the employment tax credit may alter a firm's economic environment. I then examine the way that this change in a firm's economic environment is likely to change the firm's behavior from what it otherwise would be.

Parameters of the Employment Tax Credit

The Employment Tax Credit (ETC) works by providing a credit against employer taxes equal to 50 percent of the excess of wages subject to federal unemployment insurance taxes in the 1977 or 1978 tax year over 102 percent of taxable wages for unemployment insurance paid in the previous year. Since taxable wages for unemployment insurance include only the first $4200 of earnings, an employer that pays each worker at least $4200 receives a tax credit of

\[(1) \quad C = 0.5 \left( 4200 \right) \left[ E - 1.02E_0 \right],\]

where \( E \) is current employment and \( E_0 \) is employment in the previous year. For an employer that employs primarily full-time workers it is virtually certain that actual annual wages per employee will exceed $4200 since so low a figure would imply an hourly wage of less than $2 per hour, but for employers with part-time workers this may not be the case.

However, for employers that make annual wage payments per employee (W) less than $4200 the ETC provides a tax credit of

\[(2) \quad C' = 0.5 \left( WE - 1.05 W_0 E_0 \right),\]

where \( W \) and \( W_0 \) reflect annual wage payments per employee in the given and
previous years, respectively. Formula (2) also applies as an upper bound on the tax credit applicable to an employer with annual wages above $4200 per year, but it is easy to see that it will not be binding so long as such employers increase annual wage rates by at least five percent per year.\footnote{Write equation (2) as }\footnote{For example, formula (1) implies that a firm paying ten workers $8400 per year could replace these workers by twenty others working half-time at $4200 per year and receive a tax credit of $20,580. Formula (2) eliminates this possibility.}

Moreover, formula (2) serves to constrain employers with annual wages greater than $4200 from substituting part-time for full-time workers within their employment base in order to obtain a tax credit.\footnote{Of course, it does not reduce the incentive to substitute part-time for full-time workers among new employees.} Now the basic goal of a marginal employment subsidy is to reduce the wage rate for marginally hired workers by the proportion $\theta$. If the rate of income taxation faced by the employer is $t$ and if the fraction of incremental wage bill applicable as a tax credit is $\theta'$, then the after tax wage rate is reduced from $(1-t)W$ to $(1-t-\theta')W$ or by the proportion $\theta = \theta'/(1-t)$. As pointed out by the Congressional Budget Office staff \cite{1} this could lead to $\theta > 1$ if either $\theta'$ or $t$ were large enough. For example, with $t = .48$ and $\theta' = .5$, $\theta = .96$ and employers pay only four percent of the cost of hiring a worker whose annual wage is $4200 or less. This does not happen with the ETC, however, because the employer's deduction for wages against revenues for income tax purposes is reduced by the amount of the tax credit.
In this case \( \theta' = .5 \) and the after tax wage is reduced from \( (1-t)W \) to \((1-.5t-.5)W\), which is precisely the proportion \( \theta = .5 \).

This would be the end of the story except that the tax credit applies only to wages subject to unemployment insurance taxes. If \( W > 4200 \), then the employer receives a subsidy on only the fraction \( \lambda = 4200/W \) of an employee's annual wage. The effective subsidy rate is then \( .5\lambda = 2100/W \) and is higher for low wage than for high wage employers.

Finally, the employment tax credit differs considerably from most proposed marginal employment subsidies because of two alternative limits on the size of the tax credit that may be taken. In particular, the tax credit may be no larger than the smaller of (a) 25 percent of unemployment insurance taxable wages or (b) $100,000. The importance of this is that incremental employment above some level is no longer subsidized, so that for still greater employment \( \theta = 0 \). It is interesting to inquire as to the employment growth ratio after which the marginal subsidy for employment vanishes among firms paying at least $4200 per employee. It is easy to see that this "maximum subsidizable employment growth ratio", \( E^*/E_0 \), depends on the initial size of the firm. For rule (a) we require that

\[
(3) \quad .5(4200)(E_0 - 1.02E_0) \leq .25E,
\]

so that \( E^*/E_0 = 2.04 \) defines the employment ratio above which the marginal subsidy vanishes. For rule (b) we require that

\[
(4) \quad .5(4200)(E_0 - 1.02E_0) \leq 100,000,
\]

so that \( E^*/E_0 = 1.02 + (47.6/E_0) \), and approaches 1.02 as a limit. The
minimum of rules (3) and (4) always must apply and it is easy to verify by equating $E^*/E_o$ for the two rules that (3) applies when $E_o < 47$, while for larger firms (4) applies. This issue is illustrated in Table 1.

To sum up, the proportionate decline in the wage is:

- $\theta = 0$ for $E/E_o < 1.02$
- $\theta = 2100/W$ for $1.02 < E/E_o < E^*/E_o$
- $\theta = 0$ for $E/E_o > E^*/E_o$

Behavioral Effects of the Employment Tax Credit

In the presence of the ETC employers should behave as if the wage they must pay is $\theta$ percent lower than they would otherwise have paid so long as there employment growth ratio in the absence of the program, $E/E_o$, falls in the interval $1.02 < E/E_o < E^*/E_o$. Thus, employers for which $E/E_o < 1.02$ are unaffected and receive no subsidy. Employers for which $1.02 < E/E_o < E^*/E_o$ receive a subsidy and increase their employment by the proportion $-e\theta$ or $(E^* - E)/E$ whichever is the smaller, where $e = (2E/3W)(W/R)$ is the (output-constant) elasticity of demand for labor. Finally, employers for which $E/E_o > E^*/E_o$ receive a subsidy and are unaffected. It follows, therefore, that the fact that a firm receives a subsidy does not imply that it has changed its behavior from what it would otherwise have been. Employers for which $E/E_o > E^*/E_o$ receive a lump sum subsidy, but do not change their behavior.

This is not quite the end of the story, however, because there are some employers for whom $E/E_o < 1.02$ who will find it profitable to increase their employment enough to qualify for the subsidy. To see what determines which employers this will be consider the cost $C(W, R, Q)$ of producing the output $Q$ without the subsidy at wage rate $W$ and price $R$ for other inputs. The cost of producing the same $Q$ at price $R$ in the presence of the subsidy...
is $C[(1 - \theta)W, R, Q]$ plus the extra payment $(1.02)\delta W_o$. Thus, the employer opts to take the subsidy if

\[(5) \quad C[(1-\theta)W, R, Q] + (1.02) \delta W_o < C(W, R, Q),\]

that is, if costs while taking the subsidy are less than in the absence of the subsidy. Alternatively, an employer takes the subsidy if

\[(6) \quad C[(1-\theta)W, R, Q] - C(W, R, Q) < -(1.02) \delta W_o.\]

To gain some insight into the inequality (6) it is natural to approximate its left-hand side by a second-order Taylor series around the equilibrium in the absence of the subsidy to obtain

\[(7) \quad C[(1-\theta)W, R, Q] - C(W, R, Q) = -\left(\frac{3C}{3W}\right)^2 \delta W + \frac{1}{2}\left(\frac{\partial^2 C}{\partial W^2}\right)^2 (\delta W)^2 \]

\[= -E^2 W + (1/2)(\delta E/\delta W)\delta W^2,\]

where I have used the elementary properties of the cost function, $\partial C/\partial W = E$, $\partial^2 C/\partial W^2 = \delta E/\partial W$. Combining (6) and (7) it follows that, as an approximation, the firm will opt for the subsidy so long as

$$1.02 E_o - E + (1/2)(\delta E/\delta W)\delta W < 0.$$  

Since $\delta E/\delta W \leq 0$, firms for which the employment growth ratio in the absence of the subsidy is greater than 1.02 will obviously accept it. Employers with lower employment growth ratios will also accept the subsidy, however, so long as

\[(8) \quad E/E_o > \bar{E}/E_o = 1.02/(1 - .5\theta).\]
I have called $\tilde{E}/E_o$ the opting-in employment growth ratio since any growth ratio greater than $E/E_o$ is large enough to compel the employer to increase its employment to at least the level $(1.02)E_o$ in order to qualify for the employment tax credit. Calculations of various values of $\tilde{E}/E_o$ using (6) are contained in Table 2 using estimates of high, medium, and low values of $e$ as summarized by Hamermesh [2]. Some other estimates of $\tilde{E}/E_o$ based on estimates of a cost function fitted to aggregate manufacturing industry in the U.S. are contained in the useful paper by Kesselman, Williamson, and Berndt [3]. Also of interest is the analysis of Bishop and Lerman [1].

To this point I have analyzed the ETC as if production and input demand decisions were made by employers on an entirely static basis. Since the ETC is meant to apply only for the 1977 and 1978 tax years, however, it is important to see whether the analysis requires amendment when due allowance is made for the possibility of intertemporal substitution of factor inputs. In fact, it is a relatively easy matter to show that the analysis in this intertemporal context is virtually identical to the analysis above, but with the stipulation that $e$ measures the (output-constant) effect of a change in the current-period wage on current-period labor demand when future wages remain unchanged. This amendment has two important consequences. First, $e$ now measures the ease of substituting current-period labor for capital and future labor inputs. Presumably the ease of this latter substitution will depend on the extent to which the employer's output may be carried as inventory. For employers that produce perishable commodities as services this amendment is likely to be of little consequence, but for other employers $e$ may be of considerably greater magnitude than would otherwise be expected. Second, it is clear that the presence of the ETC in the initial period of the
production plan will generally affect the demand for labor services not only in the initial production period, but also in future periods as well. Thus, a complete evaluation would require estimates of the ETC on current-period employment and on future-period employment as well. Where the inventory accumulation process allows considerable substitution of current labor inputs for future labor inputs, for example, today's ETC may have detrimental effects on tomorrow's employment.


