NBER WORKING PAPER SERIES

THE EFFECT OF THE INVESTMENT TAX CREDIT ON THE VALUE OF THE FIRM

Andrew B. Lyon

Working Paper No. 2537

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1988

This paper is based on research in my Ph.D. dissertation submitted to Princeton University. I would like to thank Harvey Rosen, Don Fullerton, and David Bradford for suggestions and guidance I received in writing the dissertation. The research reported here is part of the NBER's research program in Taxation. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research. Support from The Lynde and Harry Bradley Foundation is gratefully acknowledged.

NBER Working Paper #2537
March 1988

The Effect of the Investment Tax Credit on the Value of the Firm

ABSTRACT

A change in the tax law that increases investment incentives for new assets may result in excess returns on new investment, causing firm value to increase. Alternatively, because the investment incentives apply only to new investments, the value of existing assets that compete with these investments may decline. A model is developed in this paper which shows that in general investment incentives have a theoretically ambiguous effect on firm value. Models proposed by Abel (1982), Auerbach and Kotlikoff (1983), and Feldstein (1981) are shown to be special cases of this more general model. Empirical tests examine the changes in firm value to repeated changes of the investment tax credit. Cross-sectional tests find the changes in firm value are positively related to the expected receipt of investment tax credits. No evidence is found to support a relationship between expected changes in the value of a firm's existing assets and changes in firm value.

Andrew B. Lyon
Bureau of Business and
Economic Research and
Department of Economics
University of Maryland
College Park, Maryland 20742
(301) 454-2303

The Tax Reform Act of 1986 repealed the investment tax credit (ITC), marking the third time the ITC has either been suspended or repealed since its introduction in 1962. The ITC was originally designed to encourage new investment by reducing the after-tax cost of new investment at a smaller cost to the government than from a statutory tax rate reduction. An ITC only reduces the tax burden of new investment, while a statutory rate reduction also reduces tax revenues from existing investment. To prevent existing assets from being resold to qualify for the ITC, the amount of used investment eligible for the ITC always was strictly limited.

The selective lowering of the effective tax rate faced by new investment through the ITC is traditionally thought to increase the after-tax return from new investment, without altering the profitability of existing assets. Under this assumption, the value of the firm must increase following the introduction of an ITC. Abel (1982) presents a partial equilibrium model that supports this view, which will be referred to as the "traditional hypothesis."

The traditional hypothesis has been challenged by Auerbach and Kotlikoff (1983) and Feldstein (1981). The Auerbach-Kotlikoff-Feldstein (A-K-F) hypothesis maintains that the value of a firm must decline following the introduction of an ITC. They argue that if competition eliminates any excess return to new investment, then the value of existing assets must decline by the amount of the ITC in order to compete in the output market with the subsidized new investment. Following this view, Downs and Hendershott (1987) derive the theoretical increases in the value of firms from the 1986 Tax Reform Act.

Summers (1981, 1983), Gravelle (1984), and, more recently, Auerbach (1986) note the ambiguous effects of an ITC on firm value. The long-run equilibrium value of existing capital is expected to decline by the amount of the ITC. Until the long-run equilibrium is reached, however, new investment may earn an excess return. Whether the value of the firm increases or decreases upon the implementation of the ITC depends on the magnitude of these excess returns.

Auerbach and Kotlikoff warn that the ITC and similar accelerated depreciation provisions may cause "significant inframarginal redistribution from current holders of wealth to those with small or zero claims on the existing stock of capital." The actual direction and magnitude of the wealth redistribution caused by these investment incentives and other tax policies is an important issue in the design of tax reform. As suggested by Feldstein (1976), policymakers may seek to minimize any windfall gains and losses that accompany tax reform. Knowledge of the magnitude of the wealth transfers is essential in comparing alternative proposals and in weighing these redistributions against the efficiency gains of each proposal. In addition to equity considerations, wealth redistribution can have important real effects on the economy through changes in saving, consumption, and bequests. These wealth effects can either reinforce or offset the direct incentive effects of a tax policy on saving or consumption.

The many past legislative changes to the ITC provide an excellent "natural experiment" to examine the actual effect of the ITC on the value of the firm. For publicly traded firms, changes in the value of a firm may be observed by changes in the value of the firm's common stock. Data on the value of a firm's assets and the amount of investment in assets eligible for the ITC may be used to construct estimates of the change in the value of the firm predicted by the traditional hypothesis and the A-K-F hypothesis. If the traditional hypothesis is correct, firms that are expected to invest in a significant amount of equipment eligible for the ITC should increase in value relative to other firms when an ITC is implemented. If the A-K-F hypothesis is correct, firms that intensively own assets that would be eligible for the ITC if purchased new should decline in value relative to other firms when an ITC is implemented.

The structure of this paper is as follows. Section I develops a model to present the possible theoretical effects of changes in ITCs on the value of the firm. Section II presents the empirical procedures for testing the traditional hypothesis and the A-K-F hypothesis. Section III presents the empirical results. The empirical estimates provide substantial support for the traditional hypothesis and tend to reject the A-K-F hypothesis. The final section provides conclusions to the analysis.

I. The Theoretical Effects of Investment Incentives on the Value of the Firm

The value of a firm consists of both the value of the firm's existing assets and the excess return, if any, the firm can earn on its future investment. Investment incentives may affect these two components of firm value in opposite directions. An ITC may increase the return from new investment, while it reduces the value of a firm's existing assets. In general, the effect of investment incentives on the value of the firm is ambiguous.

One condition under which inframarginal new investment may earn an excess return is if there are costs of adjusting to a new level of capital.[1] These adjustment costs may include costs of installing the new investment, interference with current production, and managerial effort. If adjustment costs are a convex function of investment, inframarginal investment is able to earn an excess return.

The following model of the value of a firm can help illustrate the effects of an ITC on firm value. Consider a firm i with a production function $F(K_{it})$,

---

[1] See Eisner and Strotz (1963), Lucas (1967), Gould (1968), Treadway (1969) and Mussa (1977).

where K_{it} is the firm's stock of capital at time t, $F'>0$, and $F''\leq 0$. Let the total cost to the firm, before taxes, of investing I_{it} be $I_{it} + c(I_{it})$, where c is the adjustment cost function with $c'>0$ and $c''>0$. Assume the following parameters: the initial price of the firm's output is p_0, the constant after-tax discount rate is r,[2] the firm's tax rate is u,[3] the initial rate of the ITC is k_0, the present value of depreciation allowances per dollar of investment is Z, and the present value of remaining depreciation allowances on all existing capital at time s is B_{is}. It is assumed that adjustment costs reduce current profits so that the after-tax adjustment cost is $(1-u)c(I_{it})$. The value of the firm at time s may then be written as

$$V_{is}=\int_s^\infty((1-u)p_0F(K_{it})-[1-k_0-uZ](I_{it})-(1-u)c(I_{it}))e^{-r(t-s)}dt + uB_{is} \qquad (1)$$

Let us assume that initially the economy is in equilibrium with $k_0=0$ and at time s the rate of the ITC is increased to $k_1>0$. If the output price remains constant (as in Abel (1982)), then the ITC can only increase firm value. The firm could maintain the same time path of investment as it would in the absence of an ITC, yet at a lower cost. If the firm increased investment, its profits would be even greater.

If the output price is not constant, the conclusion that the introduction of

---

2 The supply of funds to firms is assumed to be infinitely elastic so that the after-tax discount rate is unaffected by the level of investment. As discussed in footnote 4 this assumption may be relaxed in showing that firm value may not always increase when an ITC is introduced.

3 The model abstracts from personal taxes. In the presence of personal taxes firm value might be affected differently depending on whether the change in cash-flow is expected to affect dividends or retained earnings.

an ITC unambiguously increases firm value no longer holds.[4] First, consider the case with no adjustment costs where an ITC at rate k_1 induces new firms to enter and reduces output price to p_1. With no adjustment costs, an entrant j would find it profitable to invest until

$$1-k_1-uZ = \int_s^\infty ((1-u)p_1F'(K_{jt}))e^{-(r+\delta)(t-s)}dt, \qquad (2)$$

where δ is the exponential rate of depreciation. Equation (2) states that firm j invests until the marginal profit from an additional unit of capital for firm j equals the net cost of investment.

With the inclusion of adjustment costs the result is similar. If each firm views itself as too small to affect output price but takes the new output price into consideration in formulating its investment decisions, firms will undertake any investment opportunities for which the present value of the after-tax returns from an additional unit of capital exceed the after-tax cost of investment. The solution to Equation (1) for the optimal level of investment is then

$$1-k_1-uZ + (1-u)c' = \int_s^\infty ((1-u)p_1F'(K_{it}))e^{-(r+\delta)(t-s)}dt. \qquad (3)$$

The firm invests until the profits from a marginal investment equal the net cost of investment plus the marginal cost of adjustment.

Because each unit of capital earns the return given by Equation (3), the total returns from the investment of the quantity I_{is} are

$$I_{is}[1-k_1-uZ] + I_{is}(1-u)c'. \qquad (4)$$

The net profit from the investment I_{is} is positive since the convexity of the adjustment cost function implies $(1-u)[I_{is}c' - c(I_{is})] > 0$. This is the excess return earned from new investment in period s.

---

[4] Alternatively, the assumption of a fixed output price may be maintained and firm value may still decline if (1) the after-tax rate of return is not constant ($r_1 > r_0$) or (2) in the more general case with labor in the production function, the supply of labor is fixed in the economy but mobile among firms.

The total excess return to future investment is given by

$$(1-u)\int_s^\infty((I_{it})c' - c(I_{it}))e^{-r(t-s)}dt. \quad (5)$$

If there were no decline in the return to existing capital, this is the amount by which the value of the firm would increase.

While inframarginal new investment earns an excess return, the increase in the ITC causes an increase in investment and output; as a result, output price declines causing the profit from a unit of existing capital to decline. Assuming the economy was in equilibrium with no ITC initially, the decline in value of a unit of existing capital is (from Equation (3))

$$[1-uZ] - [1-k_1-uZ+(1-u)c'] = k_1 - (1-u)c'. \quad (6)$$

The total change in the value of the firm is ambiguous, depending on the magnitude of the excess return to new investment, shown in Equation (5), relative to the decline in the value of the existing capital stock.

One special case where the value of the firm must increase following the implementation of an ITC is under the condition of an infinite marginal cost of adjustment for expansion of the capital stock, but no adjustment cost for investment less than or equal to depreciation. Assuming that in the absence of an ITC ($k_0=0$) each firm would have chosen investment equal to its depreciated capital in each period, then from Equation (1) the implementation of an ITC at rate k_1 must increase the value of the firm by

$$\int_s^\infty k_1 I_{it}e^{-r(t-s)}dt = \delta K_{is}k_1/r, \quad (7)$$

where δ is the depreciation rate of capital. Because output does not change in this particular case, there is no decline in the value of existing capital and the result found by Abel that the value of the firm must increase also is found here.

As suggested earlier, a special case supporting the A-K-F hypothesis that the value of the firm must decrease following the implementation of an ITC is where there are no costs of adjustment. Solving Equation (1) for the optimal level of investment for an ITC at rate k_1 under the assumption of no adjustment costs yields

$$1-k_1-uZ = \int_s^\infty((1-u)p_1 F'(K_{it}))e^{-(r+\delta)(t-s)}dt. \qquad (8)$$

The marginal return to each unit of existing capital declines by k_1, and because there is no excess return to new investment, the value of the firm declines by $k_1 K_{is}$.[5]

This discussion has shown the theoretical ambiguity of the effects of changes in investment incentives for new assets on firm valuation. If adjustment costs are small and the economy quickly reaches its new equilibrium level of capital stock, the A-K-F hypothesis of a decline in the value of the firm may be most appropriate. If adjustment costs are large, then excess profits on new investment may be substantial and the traditional hypothesis may most accurately describe changes in firm value. If adjustment costs differ across firms and industries, no single theory may adequately describe the economy-wide effects of investment incentives on firm valuation. The following sections of this paper develop an empirical test of the two hypotheses to determine their actual ability to account for changes in firm valuation following changes in the ITC.

---

[5] The value of a unit of capital would decline by less than k_1 if the supply curve for new capital goods were not perfectly elastic. Provided that all new capital goods are sold at the same price in any period and that the supply curve is not perfectly inelastic, the A-K-F hypothesis still predicts that the value of the firm will decline.

II. Empirical Procedures

The analysis in this section provides an empirical framework for modeling and estimating the change in value of the firm predicted by the traditional and A-K-F hypotheses following changes to the ITC. First, measures representing the two hypotheses are formulated and, second, the relationship between these measures and the estimated change in value of firms is analyzed.

A. Representing the Traditional and A-K-F Hypotheses

The ITC applied predominantly to purchases of new equipment and public utility property. During the period examined in this paper, the rate of the ITC ranged from a maximum of seven percent for long-lived equipment to 2 1/3 percent for short-lived equipment.[6] Public utility property was eligible for only 3/7 of the applicable percentage until 1971.

Under the traditional hypothesis, the saving provided by the ITC for the purchase of an asset results in higher profits for the firm. Let k_j be the applicable rate of the ITC for asset j, where $j=1,\ldots,J$. Let I_{ij} be the gross expenditure (gross of depreciation and gross of the ITC) by firm i on asset j in a given year. If the traditional hypothesis is correct, the benefit to the firm in that year is equal to the total amount of ITCs received by the firm[7]

$$\sum_{j=1}^{J} k_j I_{ij}. \tag{9}$$

The increase in the value of the firm at the time of the announcement of the tax change is the present value of these future benefits. Under the assumption that

---

[6] The maximum rate of the ITC was increased to 10 percent in 1975.

[7] This assumes the firm has sufficient tax liability against which the ITC may be applied. Altshuler and Auerbach (1987) estimate that between 1976-1980 approximately 25 percent of all firms may have been constrained in their use of ITCs due to present and past losses and limits on the percentage of tax liability that may be offset with ITCs.

the return to new investment is increased by the entire amount of the ITC, the percentage change in firm value is

$$\sum_{j=1}^{J} [k_j I_{ij}/V_i]/(r-g), \tag{10}$$

where V is the current value of the firm, g is the expected real growth rate of the firm, and r is the real after-tax discount rate. This is a more general expression of the change in the value of the firm given in Equation (7), which was derived under the assumption of an infinite cost of adjustment for investment in excess of depreciation.

If the adjustment cost is not infinite, the entry of further investment would be expected to limit the extent to which the benefit of the ITC persists into the future. In this study, it is assumed that all firms have the same discount rate and expected growth rate. The percentage change in firm value predicted by the traditional hypothesis is assumed to be a function of

$$\sum_{j=1}^{J} k_j I_{ij}/V_i. \tag{11}$$

Under the A-K-F hypothesis, the decline in value of an existing asset is directly related to the rate of the ITC on new assets against which it must compete. If there are no adjustment costs, the percentage decline in the value of the firm is given by

$$\sum_{j=1}^{J} k_j K_{ij}/V_i. \tag{12}$$

If there are adjustment costs, existing assets will not decline in value by the full amount of the ITC. It is assumed that the percentage decline in firm value predicted by the A-K-F hypothesis is a function of Equation (12).

To estimate the values of Equations (11) and (12) for a firm, data representing each of the variables are required.[8] A detailed data set on the capital stock of 25 types of assets eligible for the ITC, other depreciable assets, and land present in each of 44 industry groups has been constructed by Jorgenson.[9] It is assumed in this study that the proportion of capital stock held among all depreciable assets is the same for all firms in a given industry. It is also assumed that the proportion of investment in each asset is equal to the proportion of capital stock in each asset.[10] Assets eligible for the ITC and the ITC rate for each asset in the period before 1971 are shown in Table 1.[11]

COMPUSTAT data are used to provide the total amount of investment and capital of each firm. Two alternative measures are used to represent the expected investment of the firm: (1) current capital expenditures and (2) the book value of depreciation. If the investment plans of the firm are unknown in advance to investors, depreciation may better represent expected investment than actual expenditures. The book value of the firm's net plant and equipment is

---

[8] Alternatively, the quantity of ITCs actually received by the firm may be used in the numerator of Equation (11). During the period examined many firms did not report the ITC and some firms reported only an amortized portion of the ITC. There may be a sample selection bias in using only firms that reported the full ITC in their income statements. Ayres (1987) examines 175 firms which reported full receipt of the ITC and finds the change in firm value to be positively related to reported ITCs.

[9] Using capital flow tables on the amount of investment in each asset and applying economic rates of depreciation to past investment, Jorgenson has estimated the net stock of each of these assets present in the 44 industry groups for the year 1977. The construction of this data set is explained in more detail in Fraumeni and Jorgenson (1980) and Jorgenson and Sullivan (1981). The actual data are unpublished.

[10] The U.S. Department of Commerce (1980) has published data on gross investment in each asset for 76 industry groups in 1972. This data set was used in preliminary tests and yielded very similar statistical results to those found for the Jorgenson data set.

[11] The applicable rate of the ITC is based on the 1962 Depreciation Guideline tax life for each asset. These lives are derived for each of the 25 types of assets by Jorgenson and Sullivan (1981).

used to represent the capital stock of the firm. Finally, the total value of the firm is taken to be the book value of total assets, which includes net plant and equipment, inventories, cash equivalents, and certain intangible assets.

These variables are combined with (1) the industry-specific proportions of assets eligible for the ITC from the Jorgenson data set and (2) the applicable rate of the ITC for each asset to construct two alternative measures of Equation (11) and one measure of Equation (12). The two measures representing the traditional hypothesis in Equation (11) are labelled CAPTA and DEPTA, where the measures are constructed using capital expenditures and depreciation, respectively. The measure representing the A-K-F hypothesis, based on the net plant and equipment of the firm, is labelled NPTA.[12]

B. Estimating Changes in Firm Value from the Investment Tax Credit

The ITC was first introduced in the Revenue Act of 1962 following lengthy legislative debate. Between 1966 and 1971 the ITC was suspended twice and reinstated twice by presidential request. In 1986 the ITC was repealed as part of the 1986 Tax Reform Act, following the recommendation of a November 1984 Treasury Department study.

Unlike the initial enactment and recent repeal of the ITC, the series of presidential requests between 1966 and 1971 initiated fast congressional action

[12] To examine the accuracy of the variables DEPTA and CAPTA in identifying the quantity of ITCs received by a firm in a given year, a comparison was made between these calculated values and Internal Revenue Service data. The variables DEPTA, CAPTA, and NPTA were constructed for fiscal year 1968 for 710, 685, and 711 firms, respectively. IRS data on ITCs received by firms by industry group and asset size within each industry group are taken from Statistics of Income 1968, Corporate Tax Returns (1972), table 4, pp. 26-58. The 711 firms may be placed into 29 IRS industry classifications and correspond to 109 IRS industry-asset group classifications. The IRS information was used to calculate the ratio of the ITC received by a group to its total assets for each of the 109 groups. The correlation between this IRS variable and the measures DEPTA, CAPTA, and NPTA are .44, .36, and .45, respectively. These measures do appear to distinguish differences in the level of ITCs received by the different groups of firms.

leading to the reinstatement or suspension of the ITC. In September 1966, President Johnson requested the immediate temporary suspension of ITC until January 1968. The next change came in March 1967 when President Johnson asked for the immediate reinstatement of the credit. In April 1969, President Nixon requested the permanent repeal of the ITC. The fourth change came in August 1971 when President Nixon asked for the reenactment of the ITC. This series of events provides an excellent opportunity to examine the effect of changes to the ITC on the value of the firm.[13]

To test whether firms were affected by the presidential requests leading to the suspension or reinstatement of the ITC, firm stock prices are examined. A version of the Capital Asset Pricing Model is estimated, where it is assumed that security returns for firm i conform to the model

$$R_{it}-R_{90t}= \beta_i(R_{mt}-R_{90t})+\delta_{i,66}D_{66}+\delta_{i,67}D_{67}+\delta_{i,69}D_{69}+\delta_{i,71}D_{71}+\epsilon_{it}, \qquad (13)$$

where $R=\log(1+r)$, and r_{it} is the return to security i in month t, r_{mt} is the value-weighted return to the market portfolio, and r_{90t} is the return on a 90-day Treasury bill. It is assumed that the residual ϵ_{it} is normally distributed with mean zero. The D's are dummy variables, with each subscript denoting the year of the presidential request. The value of each dummy variable is one in the month of a presidential request to reinstate the ITC, negative one in a month to suspend the ITC, and zero otherwise. For example, D_{66} is equal to negative one in September 1966 and zero for all other months. The estimated β_i coefficients measure the covariance of the return of security i with the market return over all months. The δ_i coefficients measure the abnormal return to security i in the month of each presidential request. A t-test on an estimated δ_i coefficient

---

[13] These dates were selected prior to any empirical tests. No other dates were tested.

provides a measure of the significance of the abnormal return for the month of the presidential request to change the ITC.[14]

If we assume that each of the four tax changes are of equal importance, equally unanticipated, and the abnormal return to a security for the reinstatement of the credit is opposite to the abnormal return for the suspension of the credit, Equation (13) can be simplified.[15] A measure of the significance of all the changes to the ITC can be estimated from the model

$$R_{it}-R_{90t}= \beta_i(R_{mt}-R_{90t}) + \delta_{i,all}\, D_{all}+ \epsilon_{it} \qquad (14)$$

as a t-test on $\delta_{i,all}$, where $D_{all}= D_{66} + D_{67} + D_{69} + D_{71}$.

Two different estimation procedures are used to evaluate the estimates provided by variants of Equations (13) and (14) and to compare the estimates of the abnormal firm returns with the changes predicted by the traditional hypothesis and the A-K-F hypothesis. The first set of procedures assumes independence across residual returns in Equation (13) and the second set of procedures allows for these residuals to be contemporaneously cross-correlated. These procedures are explained in turn.

B.1. <u>OLS and WLS Regression Procedures</u>

In these procedures, Equation (13) and (14) are first estimated separately for each of n firms over a common time period. In the second step, the n

---

[14] An important assumption in Equations (13) and (14) is that the tax changes are unanticipated. If these changes were anticipated, little or no reaction might be expected in these months. Auerbach and Hines (1986) discuss how firm investment behavior may differ when tax changes are anticipated.

[15] The response to each tax change may differ because some of the tax changes were explicitly temporary. The ambiguous theoretical effect of ITCs on firm value even allows for the possibility that a temporary ITC could increase firm value, while a permanent ITC decreases firm value. For example, an immediate one-day ITC may be unable to affect investment, but give firms that invest on that day a windfall. Further, unless the adjustment cost function is symmetric, the repeal of an ITC may be expected to affect firm value differently from the reinstatement of an ITC.

estimated δ_i coefficients for a single tax change are used in a cross-sectional regression on one of the three variables DEPTA, CAPTA, or NPTA.

The traditional hypothesis predicts that the percentage change in the value of the firm will be positively related to the firm's receipt of ITCs relative to the total value of the firm. Using depreciation as a proxy for expected firm investment, a test of the traditional hypothesis is conducted by the cross-sectional regression

$$\hat{\delta} = a + b(\text{DEPTA}) + \mu, \tag{15}$$

where $\hat{\delta}' = [\hat{\delta}_1, \ldots, \hat{\delta}_n]$ is the vector of estimated δ_i coefficients for a single tax change from Equation (13) (for example, the vector of $\delta_{i,66}$ coefficients across all firms) or from Equation (14) ($\delta_{i,all}$) and DEPTA$' = [\text{DEPTA}_1, \ldots, \text{DEPTA}_n]$ is a vector of the DEPTA for each firm, with DEPTA defined as in Equation (11). Estimates are presented separately for each of the four tax changes and for an estimate based on $\delta_i = \hat{\delta}_{i,all}$. A similar cross-sectional regression is also estimated with CAPTA replacing DEPTA. Using either DEPTA or CAPTA, the traditional hypothesis predicts the sign of b is positive for each of the four tax changes.

The A-K-F hypothesis predicts that the change in the value of the firm will be the same as the expected change in the value of the firm's existing assets. A test of the A-K-F hypothesis is conducted by the cross-sectional regression

$$\hat{\delta} = a + b(\text{NPTA}) + \mu, \tag{16}$$

where NPTA$' = [\text{NPTA}_1, \ldots, \text{NPTA}_n]$ and NPTA is defined in Equation (12). The A-K-F hypothesis predicts the sign of b is negative for each of the four tax changes.

The variables DEPTA, CAPTA, and NPTA are likely to be highly correlated since firms that are equipment-intensive, as measured by NPTA, also are likely to have large measures of depreciation and undertake a large amount of replacement investment. If both the traditional and A-K-F hypotheses are partially correct, the estimated coefficient b in Equations (15) and (16) will reflect, in part, the effect of the opposing hypothesis. Provided CAPTA and NPTA are not highly collinear, the two hypotheses may be tested simultaneously through the cross-sectional regression

$$\hat{\delta} = a_1 + b_1(\text{CAPTA}) + b_2(\text{NPTA}) + \mu, \qquad (17)$$

A finding of $b_1>0$ and $b_2<0$ would suggest elements of both hypotheses are true.

The parameter estimates in Equations (15)-(17) are unbiased, but inefficient, if the residuals μ_i across firms do not have a common variance. It is possible that firms with larger variances of the residual returns ϵ_i in Equations (13) and (14) also will have larger variances of the residuals μ_i in Equations (15)-(17). Because the variance of an estimated δ_i coefficient is proportional to $\sigma_i^2 = E(\epsilon_i^2)$, the variance of the residuals μ may also be proportional to σ_i^2. The correction for this heteroscedasticity is to estimate Equations (15)-(17) using weighted least squares (WLS), where the weights are equal to the inverse of the estimated standard deviation from Equation (13) or (14). Estimates of Equations (15)-(17) are conducted using both OLS and WLS.

B.2. Seemingly Unrelated Regression Model Procedure

A possible disadvantage of the previous procedures is that if the residuals ϵ_{it} in Equation (13) or (14) are contemporaneously correlated across firms, the estimated δ_i are not independent across firms. King (1966) found that security returns of firms within an industry show evidence of positive contemporaneous cross-correlation. Because firms within an industry also are likely to have similar measures of DEPTA, CAPTA, and NPTA, it is more likely that these measures will be found to be significantly associated with the estimated δ_i coefficients under the assumption of independence.

To account explicitly for possible cross-correlation, it is necessary to estimate Equation (13) or (14) simultaneously across firms using Zellner's (1962) seemingly unrelated regression model (SURM). The SURM, however, requires that the number of time periods used to estimate the system be greater than the number of equations. Given the large number of firms used in this study, it is not possible to estimate the system at the firm level. As a solution to this problem, the firms are grouped into a number of portfolios.

The portfolios are formed by sorting the firms into groups based on their relative values of DEPTA, CAPTA, and NPTA. For example, to test the traditional hypothesis using the variable DEPTA, each firm is placed into one of ten portfolios based on the firm's decile rank of the variable DEPTA.[16] Equation (13) is modified to

$$R_{it}-R_{90t}= \beta_i(R_{mt}-R_{90t}) + \phi_{66}(D_{66}x X_i) + \phi_{67}(D_{67}x X_i) + \phi_{69}(D_{69}x X_i) + \phi_{71}(D_{71}x X_i) + \epsilon_{it}, \qquad (18)$$

and Equation (14) is similarly modified to

$$R_{it}-R_{90t}= \beta_i(R_{mt}-R_{90t}) + \phi_{all}(D_{all} x X_i) + \epsilon_{it}, \qquad (19)$$

where the variable X_i is equal to mean value of DEPTA, CAPTA, or NPTA for the portfolio, depending on the hypothesis tested, and the coefficient ϕ for a given year is restricted to be equal across equations.

For example, using Equation (18), ϕ_{66}, ϕ_{67}, ϕ_{69}, and ϕ_{71} are each restricted to be equal across firms, although ϕ_{66} need not equal ϕ_{67}, ϕ_{69}, or ϕ_{71}. Equation (19) is similar to estimating Equation (18) with the further restriction that $\phi_{66}=\phi_{67}=\phi_{69}=\phi_{71}$. Without the restrictions on the ϕ coefficient for a given year, say ϕ_{66}, the value of $\hat{\phi}_{i,66}(D_{66} x X_i)$ in Equation (18) for any portfolio is equal

16 The choice of the number of portfolios is arbitrary, provided it is less than the number of time periods.

to $\hat{\delta}_{i,66}$ in Equation (13). The traditional hypothesis predicts that the value of $\delta_{i,66}$ in Equation (13) increases with the value of DEPTA. If $\delta_{i,66}$ increases linearly with DEPTA, this is equivalent to a constant ϕ_{66} across portfolios in Equation (18), when X is replaced by DEPTA. The traditional hypothesis predicts all ϕ coefficients in Equation (18) and (19) are positive when X is replaced by DEPTA or CAPTA.

Similarly, the A-K-F hypothesis predicts that the value of the δ coefficients in Equation (13) is negatively related to NPTA. The A-K-F hypothesis is tested against the prediction that all ϕ coefficients are less than zero when X is replaced by NPTA.

III. Empirical Analysis

This section presents the empirical findings of the effects of the changes made to the ITC between 1966 and 1971 on firm valuation. The data are described in the first part of this section and the empirical results follow.

A. Data

The firms used in this study are drawn from 914 U.S. firms listed on the New York Stock Exchange prior to October 1965 that have complete returns for the 70-month period from April 1966 through January 1972. The 70-month period begins five months before the first presidential request to suspend the ITC and concludes five months after the final request to reinstate the ITC. The stock returns and market indices are obtained from the monthly stock returns tape of the Center for Research in Security Prices.

Firm-specific information for 711 of these firms is available from the 1970 COMPUSTAT tape of industrial firms.[17] All COMPUSTAT data are selected from the 1968 fiscal year.[18]

B.1. OLS and WLS Regression Estimates

The first empirical results presented assume independence of residual returns across firms. Estimates of $\delta_{i,66}$, $\delta_{i,67}$, $\delta_{i,69}$, $\delta_{i,71}$, and $\delta_{i,all}$ are obtained for each of the 711 firms by estimating Equations (13) and (14) separately for each firm. The set of estimated δ_i parameters of all firms for any one year is then used as the dependent variable in cross-sectional regressions on DEPTA, CAPTA, and NPTA.

The traditional hypothesis is first tested by OLS estimates of Equation (15) with the alternative dependent variables $\delta_{i,all}$, $\delta_{i,66}$, $\delta_{i,67}$, $\delta_{i,69}$, and $\delta_{i,71}$. The coefficient of DEPTA is predicted by the traditional hypothesis to be positive for each of the tax changes. The estimates are presented in the first row of Table 2.

Using the dependent variable $\delta_{i,all}$, the coefficient of DEPTA is found to be positive and highly significant at less than the 0.0001 probability level. Using the estimated δ_i for each of the four tax changes separately, the coefficient of

---

17 Of the firms for which data are not available on the COMPUSTAT tape, 110 of these firms are electric and gas utilities; 49 firms are mutual funds, holding companies, or other financial institutions; 19 firms are from the transportation services sector; and the remaining 25 firms are distributed among all other industries.

18 The fiscal year 1968 was chosen as the approximate midpoint of the four tax changes. Some tests were conducted with data from different years and with the average of 1966-1969 information. Results were similar, although fewer firms had data for all years. A match of the 914 firms using a more recent COMPUSTAT tape resulted in significantly fewer firms. Use of a single year's data may reduce the likelihood of observing a relationship between firm characteristics and changes in firm value if these firm characteristics varied over the 1966-1971 period.

DEPTA is positive and significant for three of the four tax changes. The one exception is the 1969 repeal of the ITC. The coefficient of DEPTA is negative, but insignificant, for this tax change. WLS estimates of Equation (15) are presented in the first row of Table 3. The coefficient of DEPTA changes slightly, but remains very significant for the dependent variables $\delta_{i,all}$, $\delta_{i,66}$, $\delta_{i,67}$, and $\delta_{i,71}$.

Tests of the traditional hypothesis using the alternative variable CAPTA in Equation (15) are presented in the second row of Table 2. With the dependent variable $\delta_{i,all}$, the coefficient of CAPTA is positive and highly significant. An examination of the four tax changes separately, however, shows that the coefficient of CAPTA is significant only for the two reinstatements of the ITC in 1967 and 1969. The WLS estimates, shown in the second row of Table 3, are similar. The coefficient of CAPTA is positive and significant using the dependent variables $\delta_{i,all}$, $\delta_{i,67}$, and $\delta_{i,71}$.

Recall that a possible upper-bound estimate of the percentage change in the value of the firm predicted by the traditional hypothesis is given by Equation (10) (reproduced here)

$$\sum_{j-1}^{J} [k_j I_{ij}/V_i]/(r-g), \tag{10}$$

The variables DEPTA and CAPTA are each proxies for the first term in brackets. The coefficient of DEPTA or CAPTA in Equation (14) could be as large as $1/(r-g)$ if it were believed that the ITC is permanent, there were no decline in the value of existing capital, and new investment permanently earns an excess return.

If we assume a real after-tax discount rate of 4 percent and a real growth rate of 3 percent, the coefficient of DEPTA or CAPTA could be as large as 100. With the same above conditions, except under the assumption that excess returns attributable to the ITC persist for only the first 5 years from implementation of the credit (and maintaining the assumption of no decline in the value of existing capital), the coefficient of DEPTA or CAPTA would decline to 2.2.[19]

The actual estimates of the coefficients of DEPTA and CAPTA (between 3.0 and 7.1 from the WLS estimate) suggest a fairly lengthy period during which new investment earns an excess return. The magnitude of the estimated coefficients are sensitive to the construction of DEPTA and CAPTA. If these variables understate the ITCs received by the firm then the estimated coefficients will overstate the period of adjustment.

Next, the A-K-F hypothesis is tested by conducting cross-sectional regressions on Equation (16), with NPTA as the independent variable. If assets decline in value by the full amount predicted by the A-K-F hypothesis, the value of the coefficient of NPTA would be -1. The OLS estimates are presented in the third row of Table 2. The actual estimates of the coefficient are all positive, and they are significantly positive using $\delta_{i,all}$, $\delta_{i,67}$, and $\delta_{i,71}$. The WLS estimates are shown in the third row of Table 3. The estimates are similar, except the coefficient of NPTA for the 1969 repeal of the ITC is negative. The negative coefficient is not significant, however, at standard significance levels. These estimates do not support the A-K-F hypothesis.

A correlation matrix of the independent variables DEPTA, CAPTA, and NPTA is presented in Table 4. The variables are highly correlated. As discussed in Section II, if the traditional hypothesis and the A-K-F hypothesis are both partially true, the estimated coefficient of DEPTA, CAPTA, and NPTA may reflect only the net effect of the two hypotheses on firm value. A regression that includes both CAPTA and NPTA as explanatory variables may find the predicted

---

19 This is calculated as the present value of after-tax rental savings assuming an annual depreciation rate of .15.

positive coefficient for CAPTA and a negative coefficient for NPTA. Equation (17) tests this hypothesis.

OLS estimates of Equation (17) are shown in Table 5. These estimates do not find evidence of a decline in the value of the firm to be related to NPTA. The coefficient of NPTA is negative for only one of the tax changes, and it is not significant for this tax change. WLS estimates, shown in Table 6, are similar. The failure to find support for the simultaneous operation of both hypotheses must be tempered by the fact that the high degree of collinearity between CAPTA and NPTA makes it difficult to measure the separate effects of each of the variables.

B.2. Seemingly Unrelated Regression Model Estimates

The support for the traditional hypothesis using the OLS and WLS estimates is based on the assumption that the residual returns across firms are uncorrelated. If these residuals are contemporaneously cross-correlated, the statistical significance of the relationship between the estimated δ_i coefficients and DEPTA and CAPTA may be overstated. The SURM procedure provides a more general test of the traditional and A-K-F hypotheses by controlling for the pattern of contemporaneous cross-correlation between groups of firms.

Ten portfolios are formed based on the decile ranking of a firm for each of the variables DEPTA, CAPTA, and NPTA. Equation (18) or (19) is estimated simultaneously for a group of ten portfolios, where the variable X is replaced by the mean value of DEPTA, CAPTA, or NPTA for each portfolio. The restriction that ϕ_{66}, ϕ_{67}, ϕ_{69}, ϕ_{71}, or ϕ_{all} are equal across portfolios cannot be rejected for the three sets of portfolios.

Tests of the traditional hypothesis are examined first. Estimates of Equations (18) and (19) using the ten portfolios based on DEPTA are presented in

Table 7. The estimated parameter ϕ_{all} is positive and significant. The value of the coefficient is very close to the estimated coefficient of DEPTA in Equation (15) using WLS, shown in Table 3. The significance of the coefficient is reduced slightly from the WLS estimate. The estimated ϕ coefficients for each of the four tax changes are positive. The values of these coefficients are also similar to the WLS estimates in Table 3. Of these four coefficients, however, only the coefficient for the 1971 reinstatement of the ITC is now significant.

Estimates based on the ten portfolios formed using CAPTA are shown in the second column of Table 7. The coefficient ϕ_{all} is positive and significant. The value of the coefficient is also very close to the WLS estimate of Equation (15) shown in Table 3. The coefficients for the 1967 and 1971 reinstatement of the ITC are positive and significant, although slightly less significant than the WLS estimates of Equation (15). The estimated coefficients for the other two tax changes also are positive, but not significant.

Tests of the A-K-F hypothesis using the portfolios formed on NPTA appear in the third column of Table 7. The A-K-F hypothesis predicts a negative value for the ϕ coefficients. The actual estimate of ϕ_{all} is positive and significant. The value of this parameter is also similar to the WLS estimate of the coefficient of NPTA in Equation (16). Only ϕ_{69} is estimated to be negative, and it is not significant. Of the three positive coefficients, the estimate of ϕ_{71} is found to be significantly positive.

B.3. <u>Discussion</u>

The empirical results of this section generally support the traditional hypothesis. The OLS and WLS estimates show the change in firm value from the four tax changes in aggregate ($\delta_{i,all}$) is positively related to the expected receipt of ITCs by the firm (DEPTA or CAPTA). Tests of the traditional hypothesis applying the SURM also find a highly significant positive relation between the change in firm value from the four tax changes in aggregate and measures incorporating the expected receipt of ITCs (ϕ_{all}). The estimates of each of the tax changes separately are not as significant, although the estimated values of the coefficients imply a fairly lengthy period during which new investment earns an excess return. Firms in the quartile with the largest measure of DEPTA increase in value by an average of 1.8 percentage points more than firms in the lowest quartile in the month of a presidential announcement to reinstate the ITC.[20]

The estimates do not support the A-K-F hypothesis that the ITC causes a decline in the value of existing assets that results in a decline in firm value. The change in firm value actually appears to be positively related to the ITC-weighted measure of the firm's assets (NPTA) upon introduction of an ITC, although this relationship is less significant than measures which incorporate the expected receipt of ITCs. These results suggest that the benefits a firm is expected to receive from future investment qualifying for the ITC outweigh any expected decline in the value of the firm's existing assets from increased future competition.

The magnitude of the estimates are consistent with a model providing rental cost savings (losses) to the firm equal to the full amount of the ITC over at least the first five years of investment from reinstatement (repeal) of the ITC. Excess returns on new investment may persist due to adjustment costs. Existing firms may be better able to benefit from an ITC due to their plans to replace depreciated capital. These firms may also earn economic rents on any intangible

---

[20] The hypothesis of equality can be rejected at less than the 5 percent probability level.

capital the firms possess that allow them to increase investment at a faster rate than new entrants. Further, the structure of the ITC gives the largest investment incentive to those firms with current profits. Excess tax credits are not refundable and, if no recent past tax liability exists, they must be carried forward for use in a future year, reducing the present value of the benefit. This provision would make it difficult for a start-up firm to receive the same effective ITC per dollar of investment that currently profitable firms receive. Profitable firms in industries with a low use of equipment may be encouraged to expand into equipment-intensive industries, but entry into new lines of business might be expected to occur only slowly.

IV. Summary

This paper investigates the effect of changes in investment incentives on the value of the firm. The wealth effects caused by changes in ITCs and accelerated depreciation are ambiguous, except under special conditions. If the economy is composed of perfectly competitive firms and there are no adjustment costs, the A-K-F hypothesis is shown to be theoretically correct. Alternatively, with infinite costs of adjustment to positive net investment, the traditional hypothesis is shown to be correct. In between these extremes, we know neither the magnitude nor the direction of these net effects.

The empirical findings of this paper suggest that the ITC causes a redistribution of wealth that benefits investors of new equipment. Firms that own existing equipment generally benefit, perhaps because they are in a better position to undertake new investment in equipment. Policies designed to offset directly this benefit to existing owners of capital, such as by implementing a direct wealth tax on existing capital in conjunction with an ITC, may themselves be viewed to violate equity considerations. Distributional analysis which neglects the wealth transfers caused by the implementation of an ITC, however, may overstate the progressivity of the tax system with respect to existing wealth.

The Tax Reform Act of 1986 repealed the investment tax credit (ITC), marking the third time the ITC has either been suspended or repealed since its introduction in 1962. The ITC was originally designed to encourage new investment by reducing the after-tax cost of new investment at a smaller cost to the government than from a statutory tax rate reduction. An ITC only reduces the tax burden of new investment, while a statutory rate reduction also reduces tax revenues from existing investment. To prevent existing assets from being resold to qualify for the ITC, the amount of used investment eligible for the ITC always was strictly limited.

The selective lowering of the effective tax rate faced by new investment through the ITC is traditionally thought to increase the after-tax return from new investment, without altering the profitability of existing assets. Under this assumption, the value of the firm must increase following the introduction of an ITC. Abel (1982) presents a partial equilibrium model that supports this view, which will be referred to as the "traditional hypothesis."

The traditional hypothesis has been challenged by Auerbach and Kotlikoff (1983) and Feldstein (1981). The Auerbach-Kotlikoff-Feldstein (A-K-F) hypothesis maintains that the value of a firm must decline following the introduction of an ITC. They argue that if competition eliminates any excess return to new investment, then the value of existing assets must decline by the amount of the ITC in order to compete in the output market with the subsidized new investment. Following this view, Downs and Hendershott (1987) derive the theoretical increases in the value of firms from the 1986 Tax Reform Act.

Summers (1981, 1983), Gravelle (1984), and, more recently, Auerbach (1986) note the ambiguous effects of an ITC on firm value. The long-run equilibrium value of existing capital is expected to decline by the amount of the ITC. Until the long-run equilibrium is reached, however, new investment may earn an excess

REFERENCES

Abel, Andrew B. "Dynamic Effects of Permanent and Temporary Tax Policies in a q Model of Investment." Journal of Monetary Economics 9 (1982):353-373.

Altshuler, Rosanne and Alan J. Auerbach. "The Significance of Tax Law Asymmetrics: An Empirical Investigation," National Bureau of Economic Research Working Paper No. 2279, June 1987.

Auerbach, Alan J. "Tax Reform and Adjustment Costs: The Impact on Investment and Market Value," National Bureau of Economic Research Working Paper No. 2103, December 1986.

Auerbach, Alan J. and James R. Hines. "Anticipated Tax Changes and the Timing of Investment," National Bureau of Economic Research Working Paper No. 1886, April 1986.

Auerbach, Alan J. and Laurence J. Kotlikoff. "Investment versus Savings Incentives: The Size of the Bang for the Buck and the Potential for Self-financing Business Tax Cuts," in Laurence Meyer, ed., The Economic Consequences of Government Deficits. Boston: Kluwer-Nijoff Publishing, 1983, pp. 121-149.

Ayres, Frances L. "An Empirical Assessment of the Effects of the Investment Tax Credit Legislation on Returns to Equity Securities." Journal of Accounting and Public Policy, 6 (Summer, 1987): 115-37.

Downs, Thomas and Patric R. Hendershott. "Tax Policy and Stock Prices," National Tax Journal 40 (June 1987): 171-182.

Eisner, Robert and R.H. Strotz. "Determinants of Business Investment," in Commission on Money and Credit, Impacts of Monetary Policy. Englewood Cliffs, NJ: Prentice Hall, 1963, pp. 59-337.

Feldstein, Martin. "On the Theory of Tax Reform." Journal of Public Economics 6 (July 1976):77-104.

Feldstein, Martin. "The Tax Cut: Why the Market Dropped." The Wall Street Journal, November 11, 1981, p. 26.

Fraumeni, Barbara M. and Jorgenson, Dale W. "The Role of Capital in U.S. Economic Growth, 1948-1976," in George M. von Furstenberg, ed., Capital, Efficiency and Growth. Cambridge, Mass.: Ballinger, 1980, pp. 9-250.

Gould, John P. "Adjustment Costs in the Theory of Investment of the Firm." Review of Economic Studies 35 (January 1968): 47-55.

Gravelle, Jane G. "Effects of Changes in the Taxation of Income from Capital on Stockholders Wealth and q," mimeo (1984).

Jorgenson, Dale W. and Martin A. Sullivan. "Inflation and Capital Recovery in the United States," in Charles R. Hulten, ed., Depreciation, Inflation and the Taxation of Income from Capital. Washington, D.C.: Urban Institute, 1981.

King, Benjamin F. "Market and Industry Factors in Stock Price Behavior." Journal of Business 39 (supp., January 1966): 139-160.

Lucas, Robert E., Jr. "Adjustment Costs and the Theory of Supply." Journal of Political Economy 75 (August 1967): 321-334.

Lyon, Andrew B. "How Do Stock Prices Change when Corporate Tax Laws Change? An Empirical Analysis of the Effect of Tax Laws on the Value of the Firm." Unpublished Ph.D. dissertation, Princeton University, 1986.

Mussa, Michael. "External and Internal Adjustment Costs and the Theory of Aggregate and Firm Investment." Economica 44 (May 1977): 163-178.

Summers, Lawrence H. "Taxation and Corporate Investment: A q-theory Approach." Brookings Papers on Economic Activity (No. 1, 1981):67-127.

Summers, Lawrence H. "The Asset Price Approach to the Analysis of Capital Income Taxation," in National Tax Association-Tax Institute of America, Proceedings of the Seventy-Sixth Annual Conference, 1983, pp. 112-120.

Treadway, Arthur B. "On Rational Entrepreneurial Behavior and the Demand for Investment." Review of Economic Studies 36 (April 1969): 227-239.

U.S. Department of Commerce, Bureau of Economic Analysis. "New Structures and Equipment by Using Industries, 1972: Detailed Estimates and Methodology," Staff Paper 35. Washington, D.C.: U.S. Government Printing Office, September 1980.

Zellner, Arnold. "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias." Journal of the American Statistical Association 57 (June 1962):348-368.

Table 1

Investment Tax Credit Rates by Asset

Asset	ITC
Furniture and fixtures	.07
Fabricated metal products	.07
Engines and turbines	.07
Tractors	.0233
Agricultural machinery	.07
Construction machinery	.07
Mining and oil field machinery	.07
Metalworking machinery	.07
Special industry machinery	.07
General industry equipment	.07
Office and computing machinery	.07
Service industry machinery	.07
Electrical machinery	.07
Trucks, buses and trailers	.0467
Autos	.0233
Aircraft	.0467
Ships and boats	.07
Railroad equipment	.07
Instruments	.07
Other equipment	.07
Railroads	.07
Telephone and telegraph	.03
Electric light and power	.03
Gas	.03
Other public utilities	.03

Source: Author's calculations. See text for assumptions.

Table 2

Relationship Between Abnormal Security Return δ and the Expected Change in Firm Value: Ordinary Least Squares

Equation		$\delta_{i,all}$	$\delta_{i,66}$	$\delta_{i,67}$	$\delta_{i,69}$	$\delta_{i,71}$
(15)	DEPTA	9.585	7.418	8.842	-0.516	22.923
		(5.16)	(2.26)	(2.37)	(0.15)	(6.23)
	R^2	.036	.007	.008	.000	.052
(15)	CAPTA	3.087	-0.142	4.328	-0.291	8.600
		(4.12)	(0.11)	(2.88)	(0.21)	(5.93)
	R^2	.024	.000	.012	.000	.049
(16)	NPTA	0.907	0.427	0.918	0.056	2.260
		(4.40)	(1.17)	(2.23)	(0.15)	(5.53)
	R^2	.027	.002	.007	.000	.041

t-statistics in parentheses

Table 3

Relationship Between Abnormal Security Return δ and the Expected Change in Firm Value: Weighted Least Squares

Equation		$\delta_{i,all}$	$\delta_{i,66}$	$\delta_{i,67}$	$\delta_{i,69}$	$\delta_{i,71}$
(15)	DEPTA	7.084	8.497	6.716	-2.501	16.745
		(4.14)	(2.79)	(2.01)	(0.80)	(5.01)
(15)	CAPTA	2.962	0.877	4.909	-1.177	7.580
		(3.52)	(0.59)	(3.02)	(0.78)	(4.69)
(16)	NPTA	0.618	0.589	1.000	-0.487	1.468
		(3.08)	(1.65)	(2.58)	(1.34)	(3.74)

t-statistics in parentheses

Table 4

Correlation Matrix of Explanatory Variables

	DEPTA	CAPTA	NPTA
DEPTA	1.00		
CAPTA	0.56	1.00	
NPTA	0.72	0.68	1.00
Mean	0.00132	0.00218	0.01099
Std. Dev.	0.00081	0.00206	0.00734
Observations	710	685	711

Table 5

Relationship Between Abnormal Security Return δ and the Expected Change in Firm Value: Ordinary Least Squares Estimates of Equation (17)

	CAPTA	NPTA	R^2
$\delta_{i,all}$	1.847 (1.80)	0.517 (1.78)	.029
$\delta_{i,66}$	-2.481 (1.38)	0.976 (1.91)	.005
$\delta_{i,67}$	3.753 (1.83)	0.240 (0.41)	.012
$\delta_{i,69}$	0.150 (0.08)	-0.184 (0.34)	.000
$\delta_{i,71}$	6.079 (3.07)	1.052 (1.87)	.054

t-statistics in parentheses

Table 6

Relationship Between Abnormal Security Return δ and the Expected Change in Firm Value: Weighted Least Squares Estimates of Equation (17)

	CAPTA	NPTA
$\delta_{i,all}$	2.483 (2.16)	0.172 (0.61)
$\delta_{i,66}$	-1.787 (0.88)	0.962 (1.91)
$\delta_{i,67}$	4.196 (1.89)	0.257 (0.47)
$\delta_{i,69}$	0.129 (0.55)	-0.833 (1.63)
$\delta_{i,71}$	6.532 (2.95)	0.378 (0.69)

t-statistics in parentheses

Table 7

Seemingly Unrelated Regression Method Tests:
Parameter Estimates of the Relationship Between Abnormal Security Returns and the Expected Change in Firm Value

	DEPTA	CAPTA	NPTA
(1) ϕ_{all}	6.909 (2.79)	3.038 (3.35)	0.560 (2.01)
(2) ϕ_{66}	6.094 (1.23)	1.711 (0.94)	0.731 (1.32)
(3) ϕ_{67}	5.044 (1.01)	4.697 (2.57)	0.204 (0.37)
(4) ϕ_{69}	3.490 (0.70)	1.960 (1.08)	-.182 (0.33)
(5) ϕ_{71}	13.318 (2.67)	4.050 (2.21)	1.393 (2.51)

t-statistics in parentheses