Impact of the Repeal of the Investment Tax Credit on Firms' Investment Decisions

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Abstract

This study investigates the relationship between the 1986 repeal of the investment tax credit (ITC) and firms' capital investment rates using an ANCOVA model that includes firm size and growth rate variables as covariates. Our results demonstrate: 1) there is a significant decline in firms' investment rates between the pre-Tax Reform Act (TRA) and post-TRA periods; and 2) holding the amount of ITC available to firms constant during the two time periods, firms' investment rates remain relatively constant. We conclude that the ITC is an important determinant in firms' capital investment rates.

Introduction

The Tax Reform Act (TRA) of 1986 repealed the investment tax credit (ITC) available to firms on certain types of "qualified investments". Before this change, firms were able to treat ten percent of these "qualified investments" as an ITC. As a tax credit, the ITC allowed firms to realize a dollar-for-dollar reduction in their tax liability. Hence, the relative benefit of the ITC was greater than the benefit firms derived from tax deductible expenses.

When the ITC was originally introduced in 1962 the intention of Congress was to stimulate capital investment by firms and, consequently, stimulate economic growth [Smith 1984]. However, since 1962 the provisions of the ITC have been changed, repealed, and reintroduced several times. The ITC has been introduced (1962, 1967 and 1971) whenever Congress was of the opinion that the economy needed stimulation and repealed (1966, 1969, and 1986) when economic growth did not need stimulation (e.g., during expansionary times). However, academic research is not conclusive as to the actual effect the ITC has on the rate of firms' capital spending. The latest repeal of the ITC in 1986 was primarily on the basis that the ITC represented windfall subsidies. Congress believed that these windfall subsidies were inequitable and inefficient [Shoemaker 1991]. The current recessionary economic environment has prompted speculation within the corporate community that the ITC may be reintroduced.[1] Therefore, the results of this study are timely and relevant for policy makers.

Prior research has taken both a macro and micro approach to investigate the question of whether the ITC affects firms' investment spending. The objective of this paper is to take a firm level approach to investigate the relationship between the ITC and investment spending. Compared to prior research, the pre- versus post-TRA research design used in this study provides for a more direct test of the relationship between the ITC and firms' investment decisions.

Prior Research

The effect of the ITC on capital spending has been addressed, to some extent, in the academic literature (e.g., Hall and Jorgensen [1971], Harrison [1990], Jorgensen [1963], Jorgensen and Siebert [1968], Jorgensen and Stephenson [1967], Shoemaker [1991], Shoven [1990], Truitt and Lathan [1984]). At the macro level the results of empirical research suggest that the ITC is an effective tool for stimulating capital investment via the reduction of firms' cost of capital.

At the firm level Shoemaker [1991] investigates the relationship between the ITC and firms' investment rates during the period 1968 to 1985. Shoemaker [1991] uses a matched pair design consisting of Canadian and United States firms. The matching criterion used are: 1) industry; 2) total assets; and 3) Tobin's q. The definition of Tobin's q is derived from Salinger and Summers [1983]. The purpose of matching on Tobin's q is to control for capital investment incentives other than the ITC.

Shoemaker [1991] concludes that the ITC has a

minimal impact on the stimulation of capital investment. However, the study does have two limitations. First, the sample consists of matched pairs of firms from two different economic environments. Hence, the potential exists for uncontrolled extraneous variation. Second, along with differing definitions of "qualified investments" during the time period examined, there are variations in the ITC rates between Canada and the United States. Given this critical difference between the matched firms with respect to the ITC rate, generalizations using Shoemaker [1991] concerning firms' investment rates should be viewed with caution.

The ITC represents a dollar-for-dollar reduction in a firm's tax liability, hence, the ITC reduces a project's initial outlay and thus improves the project's probability of acceptance. Therefore, as discussed later, the implications of the ITC for investment decisions can be analyzed in terms of the project's net present value (NPV). Even though the value of the ITC to the firm can be demonstrated, there is still controversy surrounding the usefulness of the ITC as an effective tool for stimulating capital investment. Economic theory suggests that the ITC is the most effective medium for stimulating capital investment (see Shoven [1990]). However, Harrison [1990] contends that the ITC is not an effective tool for stimulating capital investment. In repealing the ITC in 1986 Congress argued that, instead of being based on economic merit, the ITC resulted in investment decisions being made more on the basis of the associated tax benefits [Federal Tax Guide 1986].

Three general inferences can be drawn from the review of prior literature. First, at the macro level economic theory and empirical research suggest that the ITC stimulates investment spending. Second, at the firm level the research design and conclusions of prior research are both insufficient and inconclusive. Third, Congressional policy makers appear to be taking a populist approach and revising ITC related legislation for reasons other than those related to sound economic rationale. Given the ambiguous contentions presented in prior literature, it would appear that further investigation of the effect of the ITC on the rate of firms' investment spending is warranted.

Relationship Between ITC and NPV

The NPV of an investment project is one of the most important investment decision criteria discussed in the finance literature. NPV is a discounted cash flow (DCF) technique that leads to decisions that are consistent with the firm's objective of maximizing shareholder wealth. For example, Moyer, McGuigan, and Kretlow [9] define the NPV of a capital expenditure as the present value of the stream of net cash flows (NCF_t) from the project minus the net investment (NINV) in the project.[2] The cash flows are discounted at the firm's cost of capital (k).

The variables that influence a project's NPV[3] are: 1) the magnitude and timing of NCF_t received during the project's life; 2) the firm's cost of capital (k); and 3) NINV. Holding both NCF_t and k constant, the smaller the project's NINV the larger the NPV.[4] Because the ITC represents a dollar-for-dollar deduction from NINV, an ITC of 10 percent results in an NINV equal to 90 percent of the NINV without the ITC. This reduction in NINV increases the probability of a project's acceptance. In effect, every dollar received as an ITC adds a like amount to the firm's value on a present value basis.

The value of the ITC in stimulating investment spending by firms can be illustrated by two examples. First, assume that a project has a positive or zero NPV before the ITC is subtracted from the initial investment outlay. In this situation, the ITC should stimulate investment by increasing the NPV of such projects.[5] At the same time that the ITC is stimulating investment, the ITC does not result in the firm accepting a negative NPV project.

Now, assume the NPV of a project is negative. If the absolute value of the negative NPV of the project is less than the ITC available for the project, then the ITC will have a positive impact on the firm's investment decision. In this case, the firm will accept a project which would not be feasible without the ITC benefit. The value of the ITC to the firm's investment decision in such situations is greater than in situations where the NPV of the project is zero or positive without the ITC. A primary reason why Congress repealed the ITC in 1986 was to prevent this type of capital investment [Federal Tax Guide 1986]. In the process, Congress may have slowed economic growth by discouraging firms' investment in "critical" projects (i.e., projects where $NPV < 0$ and $ITC \geq |NPV|$).

Two inferences can be drawn from the prior discussion. First, the ITC enhances the value of projects with an $NPV \geq 0$. Second, the ITC enables firms to accept marginal projects which would be infeasible without the ITC. For these reasons, we believe the ITC does indeed stimulate capital investment. Thus, our priors are that the investment rate did decline after the repeal of the ITC. The decrease in capital spending should be more pronounced for firms which have historically tended to invest a higher proportion of their assets in machinery and equipment.

Hypotheses

The lack of data availability prohibits an investigation of whether firms use the ITC to invest in projects that

may otherwise have a negative NPV. Instead, the focus of this study is to investigate whether the ITC is associated with a firm's investment rate. The repeal of the ITC provides a unique environment for testing this relationship because we are able to investigate the change in firms' investment rates between periods when the ITC was, and was not, available to firms. Thus, we test the following hypotheses:

Ha1: The investment rate of firms decreased from the period before the repeal of the ITC to the period after the repeal of the ITC.

Ha2: After controlling for the ITC (and other factors that may affect a firms' investment rate), the investment rate of firms decreased from the period before the repeal of the ITC to the period after the repeal of the ITC.

As a subset of our overall analysis we also investigate whether firms with higher pre-TRA investment rates in machinery and equipment experienced a greater decline in investing during the post-TRA period than firms that had not been investing as heavily in machinery and equipment. Differences in investment rates across industry groups are also investigated.

Sample and Methodology

An initial sample equal to one-third of the NYSE firms on the COMPUSTAT database for the years 1983 through 1989 is selected. Two types of firms are then excluded from the sample: financial institutions and firms in regulated industries (e.g., utilities). Firms in these industries are excluded because their investment decisions and capital structures are not homogeneous with respect to the other firms in the sample. Financial institutions tend to be more highly leveraged and, thus, their investment decision-making process is unique. The regulatory environment of firms such as utilities is an extraneous factor affecting the type of investment decisions made by those firms and controlling for this influence is difficult. As a result of these exclusions, a net sample of 374 firms is available to test the first hypothesis and 305 firms to test the second hypothesis.

A pre- and post-TRA research design is used to test the research hypotheses, with analysis of variance (ANOVA) used to test the first hypothesis and analysis of covariance (ANCOVA) to test the second hypothesis. We compare the investment rates of the same firms before and after the repeal of the ITC (i.e., each firm is pair-matched with itself). This approach allows us to control for industry effects and overcomes one limitation of Shoemaker [1991], matching firms from two different countries.

Consistent with Shoemaker [1991], we define a firm's investment rate as the change in gross property, plant, and equipment (GPPE) between periods. To facilitate the cross-sectional comparison of firms, the investment rate is standardized by the prior year's level of investment in GPPE. In order to lessen the effects of potential short-run variations in the data, each variable in the study is defined as an average. For the pre-TRA period the data are averaged for the years 1984 and 1985 and for the post-TRA period the data are averaged for the years 1988 and 1989. The years 1986 and 1987 are excluded because firms' investment policies and ITC during this two year time period may be confounded by the passage of the TRA.

Models

The purpose of Ha1 is to investigate whether the investment rate of firms did change from the pre- to post-TRA time period, without controlling for any other factors. Because we are only comparing means from two different periods, the ANOVA model we use is, in essence, equivalent to a paired t-test. The second hypothesis (Ha2) is tested using an ANCOVA model. ANCOVA allows us to control for the covariates ITC, size, and growth by including these variables in the model. Industry effects are controlled for by pair-matching firms with themselves.

The review of the literature and our illustration of NPV analysis indicate that the ITC is an important tool in stimulating capital investment by firms. Hence, we include as a covariate the ITC and posit that the ITC is positively related to the investment rate of firms. Size is included in the model to control for any effect firm size may have on a firm's investment rate. To improve the distributional characteristics of the ANCOVA model, we use the log of ITC and the log of total assets.

An additional factor that may affect the investment rate of a firm is the growth rate of that firm. Firms that have higher expectations of future growth will tend to invest today so that the appropriate assets will be in place to accommodate this growth. Hence, we include a variation of Tobin's q as a proxy for firms' expected growth rates. Tobin's q is defined as the market value of the firm divided by the replacement cost of the firm's assets. The numerator of Tobin's q reflects investors' valuation of both the assets in place and the firm's future growth potential. The denominator reflects the approximate value of assets in place. Ben-Horim and Callen [1989] argue that Tobin's q is a market value measure and as such represents the market's estimate of future growth. Varaiya, Kerin, and Weeks [1987] demonstrate that Tobin's q ratio and the ratio of market value to book value of equity are equivalent measures. Therefore, we use the market to book value of equity ratio as a proxy for firms' expected growth rate. Hence, the ANCOVA model for testing Ha2 is:

$$IR_{i,t} = \mu. + \beta_1(X_{1,i,t} - \bar{X}_1) + \beta_2(X_{2,i,t} - \bar{X}_2) + \beta_3(X_{3,i,t} - \bar{X}_3) + \epsilon_{i,t} \quad (1)$$

where

IR_i = investment rate of firm i, with t = 0 for the pre-1986 period and t = 1 for the post-1986 period,
$\mu.$ = overall mean investment rate,
$X_{1,i,t}$ = log of ITC for firm i at period t,
$X_{2,i,t}$ = log of total assets for firm i at period t,
$X_{3,i,t}$ = proxy for growth for firm i at period t,
$\epsilon_{i,t}$ = error term.

The use of an ANCOVA approach to test our second hypothesis accomplishes two objectives. First, the ITC is explicitly used as a covariate in the model. The inclusion of the ITC as a covariate is equivalent to testing the change in a firm's investment rate while holding constant the amount of ITC available to the firm. Second, we are able to reduce the variance of the error term in our model and, hence, increase the precision of our test. The precision of the test is increased because the expected value of $IR_{i,t}$ will depend not only on a firm's actual investment rate, but also on the values of the associated covariates. Thus, the inclusion of the ITC as a covariate is especially important because we expect that the ITC has an important bearing on firms' investment rates. Therefore, the actual test performed is on the adjusted group means which are denoted by:

$$\mu_{0,t} = IR_i - \sum_{n=1}^{p} \beta_k(\bar{x}_n - \bar{x}_{i,n}) \quad (2)$$

with $\mu_{0,t}$ equal to the mean rate of investment for each group with p equal to the number of covariates.

Statistical Results

A critical assumption to the ANCOVA model is the existence of parallel slopes of the covariates across groups. The test for parallel slopes is equivalent to testing for the presence of interaction between the covariates and the two groups. No significant interactions are present (F-value = 1.26 and p-value > 0.25). No serious violations are detected with respect to the assumptions of either the ANOVA or ANCOVA models.

ANOVA Model

The results from the ANOVA model are presented in Table 1. The overall ANOVA model is significant with an F-value equal to 8.13 and a p-value equal to 0.0045. With only two means to compare (pre- versus post-TRA investment rates), ANOVA reduces to a paired t-test. The results of the ANOVA model indicate that the investment rate of firms decreased from 23.60 percent during the pre-TRA period to 11.65 percent during the post-TRA period. The mean difference of 11.95 percent between the pre- and post-TRA investment rates has a p-value equal to 0.0025. This finding supports our assertion that investment rates should have decreased from the pre- to post-TRA period. However, examining the relationship between the ITC and investment rates is also of importance. This question is addressed using the previously defined ANCOVA model.

Table 1
ANOVA Results for Testing Whether There was a Change in Firms' Investment Rate: Pre- Versus Post-TRA

Variable	d.f.#	Sum of Squares	F Statistic	P-Value
Model	1	2.6985	8.13	0.0045
Error	746	247.6233		
Corrected Total	747	250.3218		

T Test of the Unadjusted Means: Investment Rate During Pre-TRA, Post-TRA, and Post Minus Pre-TRA Periods

Variable	Unadjusted Mean	t	P-Value
Change in Investment Rate	-0.1195	-2.82	0.0025*
Post-TRA Investment Rate	0.1165	6.11	0.0001
Pre-TRA Investment Rate	0.2360	6.31	0.0001

Because of the pre-post research design used the degrees of freedom is twice the number of firms in the sample.
* P-values reported are for one-tailed test.

ANCOVA Model

The results from the ANCOVA model are presented in Table 2. The overall ANCOVA model is significant with an F-value equal to 3.29 and a p-value equal to 0.0110. The ITC covariate is significant (p = .0233) and is positively related to the investment rate. A positive sign for the ITC covariate indicates that, as expected, firms' with higher investment rates are able to take a

Table 2
ANCOVA Model for the Pre Versus Post-TRA Periods: Covariates Included: Firm Size, Growth Rate, and ITC Dependent Variable: Investment Rate

Variable	d.f.	Sum of Squares	t	P-Value
Firm Size	1	1.1682	0.85	0.3952
Growth Rate	1	0.0023	0.09	0.9279
ITC	1	1.5652	1.99	0.0233*

Model F-value = 3.29, p-value = 0.0110

T Test of the Adjusted Mean: Investment Rate During Post Minus Pre-TRA Periods

Variable	Adjusted Mean	P-Value
Change in Investment Rate	-0.0847	0.0778*
Post-TRA Investment Rate	0.1365	0.0020
Pre-TRA Investment Rate	0.2212	0.0001

* P-values reported are for one-tailed test.

greater tax credit on their tax statement. The covariates representing firm size and growth are not significant (p-values of 0.3952 and 0.9279, respectively).

Additionally, the results of the test for a difference in adjusted (i.e., after controlling for the change in ITC) mean investment rates is not statistically significant (p-value = 0.0778). Hence, after adjusting the mean investment rates for the effects of the ITC, the results of the ANCOVA model indicate that firms' rates of capital investment have not changed between the time period 1984-1985 (pre-TRA period) versus 1988-1989 (post-TRA period). In other words, if the amount of ITC available to firms had remained constant during the two time periods, firms' investment rates, instead of decreasing significantly, would have remained relatively constant. This result further suggests that the ITC affects a firms' investment rate. We consider this finding as enough evidence to not accept Ha2. Our results do not provide evidence that growth or firm size are related to a firm's investment rate. It should be noted that when the firm size and growth rate covariates are removed from the model (the results are not reported) the ITC covariate is found to represent approximately 29 percent of the change in the mean investment rate.

Capital Expenditure Differences

Prior literature suggests that the repeal of the ITC should have a more pronounced effect on firms with a substantial investment in GPPE. In order to address this question, we separate the sample of firms into three equal categories on the basis of their pre-TRA investment rates. A paired t-test of the post- minus pre-TRA investment rate is then performed for each individual group. The results are presented in Table 3.

Firms in Group 1 (the lowest rate of pre-TRA capital investment) did not experience any decline in investment spending after the elimination of the ITC. Although not statistically significant, there actually was an increase in Group 1's investment rate. Group 2 firms (i.e., firms which, on the basis of pre-TRA investment rates, were ranked in the middle one-third of our sample) experienced a statistically significant (p-value = 0.0192) decline in their rate of investment spending. Group 3 firms (the highest rate of pre-TRA capital investment) also experienced a statistically significant (p-value = 0.0001) decline in their rate of investment. There was a 32.05 percent decline in the rate of capital investment for Group 3, 12.84 percent decline for Group 2, and an increase of 10.37 percent for Group 1. This result provides support for the observation that, with the removal of the ITC, firms with higher investment rates should have a more pronounced decline in their rate of capital investment.

Industry Differences

A question of secondary importance is whether there are any industry differences with respect to changes in investment rates between the pre- and post-TRA periods. To investigate this question we separate the sample into three categories: 1) mining, oil and gas; 2) manufacturing; and 3) firms in neither (1) nor (2). The results are reported in Table 4.

While the investment rates of mining firms (Panel A) increased 21.97 percent, the increase is not statistically significant (p-value = 0.5102). The lack of significance may be due to the small sample size (n = 20). This increase in the rate of investment is surprising and may be due to peculiarities specific to the mining industry. The investment rates of manufacturing firms (Panel B) decreased significantly (p-value = 0.0059), as expected, by 11.37 percent. Firms in industries other than mining or manufacturing (Panel C) also experienced a significant (p-value = 0.0133) decline of 21.23 percent in their rate of investment spending.

Overall, by separating the sample into different

Table 3
Separation of Firms by Pre-TRA Investment Rates

Panel A: Group 1, Lowest One-Third Pre-TRA Investment Rates

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	124	0.1037	0.7557	1.53	0.8710*#
Post-TRA Investment Rate	124	0.1765	0.5923	3.34	0.0011
Pre-TRA Investment Rate	124	0.0715	0.4107	1.94	0.0547

Panel B: Group 2, Middle One-Third Pre-TRA Investment Rates

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	124	-0.1284	0.6889	-2.09	0.0192*
Post-TRA Investment Rate	124	0.0811	0.1658	5.41	0.0001
Pre-TRA Investment Rate	124	0.2118	0.6685	3.58	0.0005

Panel C: Group 3, Highest One-Third Pre-TRA Investment Rates

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	124	-0.3205	0.9406	-3.82	0.0001*
Post-TRA Investment Rate	124	0.0917	0.1534	6.69	0.0001
Pre-TRA Investment Rate	124	0.4127	0.9575	4.85	0.0001

* P-values reported are for one-tailed test.
# Change was in direction opposite than hypothesized.

categories on the basis of pre-TRA investment rates and major industry groups our statistical analyses provide additional support for our contention that firms' investment rates declined during the post-TRA period. The decline in investment rates during the post-TRA period is statistically significant in two of the three categories examined. As expected, the firms with higher rate of capital investment appear to be the most susceptible to the loss of the ITC benefit.

Summary and Implications

In this study we investigate the impact of the repeal of the ITC on firms' investment decisions. A pre- post-TRA research design is employed to investigate two research hypotheses: 1) Whether firms' capital investment rates during the post-TRA period declined relative to their pre-TRA level; and 2) Whether the repeal of the ITC is a significant factor in the decline of firms' capital investment rates during the post-TRA period. In testing these hypotheses two statistical methods are employed: 1) ANOVA; and 2) ANCOVA.

The results in this study suggest that the ITC influences firms' investment decisions. The evidence from both the ANOVA and ANCOVA models indicates that firms' investment rates did decrease during the post-TRA period and that the repeal of the ITC contributed to this decline. Additionally, we find that firms with higher proportions of capital investment rates experienced larger declines in their investment rates during the post-TRA period. Thus, these results lend support to the notion that tax incentive schemes such as the ITC foster growth in investment spending.

We are of the opinion that the results of this study should help resolve the controversies surrounding the usefulness of the ITC in stimulating firms' capital investment. Furthermore, these findings have important implications for policy decisions. If policymakers intend to stimulate firms' investment rates Congress should consider reintroducing the ITC. Given the recent controversial discussions concerning the ITC, the results of this study are timely and should provide policymakers with relevant information concerning the usefulness of the ITC in promoting firms' capital investments.

Suggestions for Future Research

Given that Congress periodically modifies corporate tax law as the law pertains to firms' capital investments, we feel that further research in this area will be beneficial to the legislative process. Additionally, we suggest two lines of research in this area. First, an integrated study that includes tax law changes from several time periods should provide evidence concerning the consistency of the relationships found in this paper. Second, future research may examine the tax law changes as they relate to smaller and/or privately held corporations. ❧

*****Endnotes*****

1. Economists Feldstein and Schultze indicate that a limited tax package focused on the ITC for businesses would be a better tool to stimulate the economy than a broad-scale tax relief for individuals (Associated Press 1992).
2. In standard finance textbook examples, NINV is calculated net of the ITC, if available. However, in this equation NINV excludes the ITC benefit. In subsequent analysis we discuss the implications of the ITC to NINV.

Table 4
Separation of Firms by Industry: Mining, Manufacturing, and Other

Panel A: Mining Firms

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	20	0.2198	0.2198	0.70	0.5102*#
Post-TRA Investment Rate	20	0.3863	0.3863	1.29	0.2095
Pre-TRA Investment Rate	20	0.1666	0.1661	2.68	0.0147

Panel B: Manufacturing Firms

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	264	-0.1137	0.7278	-2.54	0.0059*
Post-TRA Investment Rate	264	0.0945	0.2219	6.92	0.0001
Pre-TRA Investment Rate	264	0.2093	0.6962	4.90	0.0001

Panel C: Firms Other than Manufacturing or Mining

Variable	n	Mean	Std Dev	t	P-Value
Change in Investment Rate	90	-0.2123	0.8889	-2.25	0.0133*
Post-TRA Investment Rate	90	0.1203	0.1731	6.63	0.0001
Pre-TRA Investment Rate	90	0.3313	0.8653	3.63	0.0005

* P-values reported are for one-tailed test.
# Change was in direction opposite than hypothesized.

3. NPV can be represented mathematically as:

$$\sum_{n=1}^{t} \frac{NCF_t}{(1+k)^t} - NINV$$

4. It can also be demonstrated that the ITC has the effect of increasing a project's internal rate of return (IRR). Thus, whether a firm uses NPV or IRR as the criterion for accepting a project, the ITC increases a project's appeal.
5. However, starting January 1, 1983, unless a taxpayer voluntarily reduces the ITC by two percent, the taxpayer is required to reduce the basis of the associated asset by 50 percent of the ITC (Smith 1984). This reduction will, to some extent, reduce the benefit of the ITC.

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