Capital Gains Taxes and Acquisition Activity: Evidence of the Lock-In Effect

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Abstract

The lock-in effect proposes that capital gains taxes represent transaction costs that increase the reservation price for security owners and, *ceteris paribus*, reduce trading volume. Consistent with the lock-in effect, previous empirical research documents price and volume reactions to enacted changes in the capital gains tax rate. We investigate whether the "volume hypothesis" predicted by the lock-in effect extends to corporate acquisition activity. In particular, we analyze whether aggregate corporate acquisition activity is inversely associated with shareholder capital gains tax rates. We measure quarterly corporate acquisition activity from 1973 through 2001 using (1) the percentage of publicly traded firms acquired in a calendar quarter and (2) the percentage of market value of publicly traded firms acquired in a calendar quarter. In supplemental analysis, we measure acquisition activity at the industry level (i.e., as the percentage of firms and percentage of market value acquired by industry in each year). In each analysis we model acquisition activity as a function of the maximum long-term capital gains tax rate for individuals and other macro-economic factors previously hypothesized to be associated with acquisition activity. Consistent with a lock-in effect for corporate acquisitions, we find a significant negative association between corporate acquisition activity and the capital gains tax rate whether we measure acquisition activity in the aggregate or at the industry level. In addition, we find that this negative association is attributable to increased (decreased) taxable acquisition activity during periods of low (high) capital gains tax rates. These results suggest that, *ceteris paribus*, capital gains taxes represent significant transaction costs or market frictions that influence the level of corporate acquisition activity.

Keywords: ***capital gains taxes; lock-in effect; mergers and acquisitions;***

Data Availability: ***Data are available from public sources identified in the paper.***

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The study of corporate acquisitions has been of long-standing interest in the finance, economics, and tax literatures. To date, there is substantial research investigating the cross-sectional determinants of the price and structure of corporate acquisitions.[1] For example, prior research demonstrates that factors such as firm liquidity, debt, size, hostility or competing bids, capital gains tax, and market-to-book ratios influence the price and/or structure of corporate acquisitions. In contrast, there remains significant debate regarding the factors that influence trends in corporate acquisition activity (e.g., merger waves). Prior research suggests that acquisition activity is associated with stock returns, industrial production, and interest rates (Nelson, 1959; Steiner, 1975; Beckenstein, 1979; Chung and Weston, 1982; Melicher, Ledolter, and D'Antonio, 1983; Guerard, 1985; Becketti, 1986; Golbe and White, 1988). More recent studies (Mitchell and Mulherin, 1996; Mulherin and Boone, 2000; Andrade, Mitchell, and Stafford, 2001; Andrade and Stafford, 2004) suggest that industry factors (e.g., industry shocks) explain a large portion of the cross-temporal variation in acquisition activity. In contrast, Shleifer and Vishny (2003) and Rhodes-Kropf, Robinson, and Viswanathan (2004) propose that stock market valuations largely drive acquisition activity. Thus, there is considerable debate regarding what factors influence acquisition

[1] For example, see Comment and Schwert, 1995; Schwert, 2000; Martin, 1996; Erickson, 1998; Eckbo, Giammarino, and Heinkel, 1990; Brown and Ryngaert, 1991; Bradley, Desai, and Kim, 1988; Erickson and Wang, 2000; Ayers, Lefanowicz, and Robinson, 2000; Ayers, Lefanowicz, and Robinson, 2003; Ayers, Lefanowicz, and Robinson, 2004; Fishman, 1989; Franks, Harris, and Mayer, 1988; Hansen, 1987; Hayn, 1989; and Weaver, 2000 among others.

activity. Indeed, Brealy and Myers (2000, p. 1015) contend that merger waves continue to be one of the top ten unexplained phenomena in the field of financial economics.

We investigate the role of capital gains tax policy and the lock-in effect on aggregate corporate acquisition activity. The lock-in effect proposes that shareholder capital gains taxes represent transaction costs that increase the reservation price for security owners thereby reducing trading volume during periods of high capital gains taxation (Feldstein and Yitzhaki, 1978; Kiefer, 1990). Consistent with a lock-in effect, previous research finds that acquisition premiums in taxable acquisitions increase with shareholder capital gains taxes (Ayers, Lefanowicz, and Robinson, 2003; Landsman and Shackelford, 1995; Hayn, 1989). Thus, prior evidence indicates that the capital gains tax increases the reservation price of target shareholders in corporate acquisitions. We investigate whether the "volume hypothesis" predicted by the lock-in effect extends to corporate acquisition activity. In particular, we analyze whether corporate acquisition activity bears an inverse relationship to the level of shareholder capital gains tax rates.

We analyze corporate acquisition activity from 1973 through 2001. During this period there were five long-term capital gains tax rate regimes with rates ranging from a high of 35 percent to a low of 20 percent. Our sample consists of acquisitions of publicly traded firms on the NYSE, AMEX, and NASDAQ. We define corporate acquisition activity as the percentage of publicly traded firms acquired in a calendar quarter. Alternatively, we replicate our analysis using the percentage of market value of NYSE, AMEX, and NASDAQ firms acquired in a calendar quarter. We model acquisition activity as a function of the maximum long-term capital gains tax rate for individuals and other macro-economic factors previously hypothesized to be associated with acquisition

activity (e.g., stock returns, interest rates, gross national product, etc.). Consistent with a lock-in effect for corporate acquisitions, we find a significant negative association between corporate acquisitions and the capital gains tax rate. Results are robust to an alternative measure of acquisition activity (percentage of market value acquired) as well as controls for other factors commonly believed to influence acquisition activity, including stock returns, interest rates, and industry shocks.

Because the effect of capital gains tax rates on taxable acquisition activity motivates our analysis, we perform supplemental analysis to verify that the negative association between acquisition activity and the capital gains tax rate is attributable to taxable (cash) acquisitions (i.e., the sample suggested by theory). In particular, we create separate quarterly observations for taxable and nontaxable (stock) acquisition activity defined as the quarterly percentage of publicly traded firms acquired in taxable and nontaxable acquisitions, respectively. We then re-estimate our regression analysis separately for taxable and nontaxable acquisition activity. Consistent with expectations, results indicate a significant negative association between the capital gains tax rate and taxable acquisition activity. We find no similar relationship for nontaxable acquisitions suggesting that our primary results are not likely attributable to other unidentified economic forces.

Finally, recent research suggests that industry factors may largely explain cross-temporal variation in corporate acquisition activity. To allow for this possibility, we re-estimate our analyses defining acquisition activity as the annual percentage (or value) of firms acquired in a two-digit SIC industry. We then model this alternative proxy for acquisition activity as a function of the maximum long-term capital gains tax rate for

individuals, other macro-economic factors, and industry factors previously hypothesized to influence acquisition activity (e.g., sales growth, cash flows, deregulation, etc.). Consistent with our primary analysis, we find a significant negative association between annual industry acquisition activity and the capital gains tax rate. We also re-estimate this analysis using separate regressions for taxable and nontaxable acquisitions. Similar to the evidence for our primary analysis, results indicate a significant negative association between the capital gains tax rate and annual taxable acquisition activity per industry. We find no similar relationship for nontaxable acquisitions.

This study makes several contributions. First and foremost, this study expands our understanding of the macro-economic determinants of acquisition activity. Results suggest that, *ceteris paribus*, capital gains tax policy exerts significant influence on corporate acquisition activity. Consistent with the lock-in effect, our findings imply that capital gains taxes operate analogously to transaction costs and are inversely associated acquisition activity. Results are robust whether we define acquisition activity in aggregate or by industry. Accordingly, evidence suggests that macroeconomic factors, such as capital gains tax policy, may in part explain a portion of the cross-temporal variation in acquisition activity by industry. This study is closely related to research investigating the effects of capital gains taxes on individual corporate acquisitions. Prior research suggests that the capital gains tax is an important influence in the price and structure (i.e., taxable cash-for-stock versus nontaxable stock-for-stock acquisitions) of corporate acquisitions. Our results suggest that the capital gains tax, on the margin, may also influence corporate acquisition activity.

The remainder of this study is organized as follows. The next two sections present our research method and describe our sample, respectively. The third section presents our results and sensitivity analyses. The final section concludes.

I. Research Method

The lock-in effect views capital gains taxes as transaction costs that increase the reservation price of security owners and thereby affect trading volume. Studies of the lock-in effect generally investigate the effect of capital gains taxes on the volume of security trading in public markets. For example, Slemrod (1982), Henderson (1990), and Ricketts and Walter (1997), among others, find increased trading volume in security markets following the capital gains tax rate decreases in the late 1970s and early 1980s. Likewise, Feldstein, Slemrod, and Yitzhaki (1980), Auten and Clotfelter (1982), Auten, Burman, and Randolph (1989), Auerbach (1989), Gillingham, Greenlees, and Zieschang (1989), and Gillingham and Greenlees (1992) conclude that capital gains realizations are sensitive to level of capital gains tax rates. Finally, Blouin, Raedy, and Shackelford (2002) investigate the effect of the 1998 reduction in the long-term capital gains tax holding period and find that, consistent with the lock-in effect, trading volume increases after the statutory change. Thus, there is ample evidence that the lock-in effect is descriptive with respect to the relation between trading volume and capital gains realizations for publicly traded stock.

Recent research suggests that the lock-in effect also affects corporate acquisitions. Ayers, Lefanowicz, and Robinson (2003), Landsman and Shackelford, (1995), and Hayn, (1989) all report empirical results indicating that acquisition premiums in taxable acquisitions increase with shareholder capital gains taxes. That is, consistent with the

lock-in effect, capital gains taxes increase the reservation price that target shareholders require in taxable acquisitions. In addition, recent research suggests that the capital gains tax also influences the type of consideration employed in corporate acquisitions. In particular, Ayers, Lefanowicz, and Robinson (2004) find in a cross-sectional study of taxable and nontaxable acquisitions from 1975 through 2000 that the likelihood of a taxable cash-for-stock acquisition (as opposed to a nontaxable stock-for-stock exchange) is inversely associated with the top individual capital gains tax rate. In other words, consistent with the lock-in effect, the preference for nontaxable stock-for-stock acquisitions increases with the capital gains tax rate.

We extend the investigation of the lock-in effect and corporate acquisitions by examining whether acquisition activity is associated with the capital gains tax rate. We conjecture that, *ceteris paribus*, capital gains taxes operate analogous to significant transaction costs thereby reducing the number of acquisitions during periods of high capital gains taxation. If our expectations hold, we anticipate an inverse association between acquisition activity and the capital gains tax rate. We recognize from Ayers, Lefanowicz, and Robinson (2004) that capital gains taxes influence the form of acquisitions (i.e., the relative preference for nontaxable stock-for-stock acquisitions increases with the capital gains tax). Accordingly, the ability to substitute nontaxable stock-for-stock acquisitions for taxable cash-for-stock acquisitions during periods of high capital gains taxation biases against our hypothesis.[2] We conjecture, however, that nontax factors (e.g., the unwillingness of the bidder's shareholders to reduce their ownership in the bidder, undervalued bidder stock, target management hostility, etc.) may

[2] If nontaxable stock-for-stock acquisitions were perfect substitutes for taxable cash-for-stock acquisitions, we would not expect any relation between the capital gains tax rate and acquisition activity.

preclude the use of nontaxable stock-for-stock exchanges in certain acquisitions. Hence, we expect, *ceteris paribus*, a decrease (an increase) in acquisition activity during periods of high (low) capital gains taxation.

Although previous empirical research investigating cross-temporal acquisition activity has not focused on the potential role of tax law changes on acquisition activity, there is ample speculation in the public press and anecdotal evidence that suggest that tax policy may in part explain a portion of the cross-temporal variation in acquisition activity. For example, in an October 30, 1986 New York Times article entitled "Tax Law Promoting a Frenzy by Companies to Finish Deals," columnist Steven Prokesch writes:

> From giant public companies to small family enterprises, companies are frantically trying to buy and sell businesses – or even liquidate themselves – before the sweeping new tax law goes into effect on Jan. 1, increasing their tax bills. The activity is unbelievable, said David G. Kay, co-head of the mergers and acquisitions department at Drexel Burnham Lambert, Inc., the investment bank. We're going as fast as we can.
>
> So are the Boston Celtics, the championship basketball franchise that is racing to sell 40 percent of itself to the public before taxes on capital gains soar on Jan. 1 and cut deeply into its owners' profits on the deal.
>
> Nothing demonstrates the intense pressure being exerted to complete deals by year-end more than the proliferation of "drop dead" clauses in acquisition agreements. They stipulate that if the transaction has not closed by the end of Dec. 31, the deal is dead.[3]

Consistent with this anecdotal evidence, Scholes and Wolfson (1990) argue that tax law changes may have first-order effects on the level of aggregate acquisition activity. They present descriptive data that suggests that the dollar value of acquisition activity

[3] Although "drop dead" clauses prior to a tax law change are likely infrequent in nature, it is common for tax-free stock-for-stock acquisitions to require the receipt of an opinion regarding the tax-free nature of the merger as a condition to merger. The existence of such a condition also suggests that, on the margin, the taxability of an acquisition to the target's shareholders may influence the acquisition's ultimate consummation.

increased after the Economic Tax Recovery Tax Act of 1981, which reduced individual capital gains tax rates and accelerated depreciation of acquired assets. Likewise, they present descriptive data that suggests that the dollar value of acquisition activity decreased after the Tax Reform Act of 1986, which increased individual capital gains tax rates and contained other provisions (e.g., elimination of the General Utilities Doctrine) that increased the tax costs of acquisitions.[4] Their descriptive analyses, however, do not incorporate controls for contemporaneous nontax factors that prior research suggests may influence acquisition activity and thus, preclude the reader from drawing a more direct conclusion regarding the role of U.S. tax policy on acquisition activity. In contrast, we evaluate the role of capital gains tax policy within the context of nontax factors that recent research suggests may be associated with acquisition activity. Accordingly, our analyses should facilitate a more clear understanding of the incremental effects of tax policy, if any, on corporate acquisition activity.

We estimate the following time-series regression that relates quarterly acquisition activity to the capital gains tax rate and variables that represent market factors previously found to be associated with acquisition activity:

$$ACQ_t = \gamma_0 + \gamma_1 CG_t + \gamma_k X_{kt} + \varepsilon_t \quad (1)$$

where:

[4] The General Utilities Doctrine allowed acquiring firms to step-up their basis in an acquired firm's assets without recognizing gain (except for investment tax credit and depreciation recapture). In sensitivity analyses, we included an indicator variable equal to one to for those acquisitions preceding January 1, 1987 (i.e., the effective date of the Tax Reform Act of 1986), and zero otherwise. Results including the TRA86 indicator variable are similar to those presented in Table 4, and the coefficient for TRA86 is not statistically significant. Thus, sensitivity analyses do not suggest that our results simply capture a TRA86 effect (e.g., the elimination of the General Utilities Doctrine).

ACQ_t = The number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in quarter *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ during quarter *t*,

CG_t = the top individual capital gains tax rate during quarter *t*, and

X_k = a vector of *k* explanatory variables representing macroeconomic variables previously found to be associated with acquisition activity.

Table 1 provides a description of the dependent and independent variables.

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insert Table 1 here

Consistent with Andrade, Mitchell, and Stafford (2001), we define acquisition activity (*ACQ*) as the percentage of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired during a calendar quarter. Deflating the number of quarterly acquisitions by the number of firms traded explicitly controls for the increasing number of publicly traded firms and thus potential acquisitions during the sample period. As an alternative measure of acquisition activity, we estimate our regression analysis using the percentage of market value of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in a calendar quarter.

We use the maximum long-term capital gains tax rate applicable to *individual* investors at the acquisition date (*CG*) to proxy for cross-temporal differences in target shareholder capital gains taxes. Bradley, Desai and Kim (1988) and Klein (1999) suggest that heterogeneity in tax characteristics causes an upward sloping supply curve for target shares. Thus, long-term shareholders (i.e., shareholders with larger unrealized capital gains taxes) are likely the price-setting shareholders in taxable acquisitions. Consistent with this theory, Ayers, Lefanowicz, and Robinson (2003) and Landsman and Shackelford (1995) provide evidence that suggests that long-term *individual* investors, on average, comprise the price-setting shareholders for their samples of corporate acquisitions. Accordingly, we posit that long-term individual shareholders, on average,

represent the price-setting shareholders in our sample of corporate acquisitions and expect $\gamma_1 < 0$. If this conjecture is incorrect and short-term investors (or corporate or other non-individual investors) are the predominant price-setting shareholders, tests are biased against rejection.[5]

We follow Golbe and White (1988), among others, in constructing variables to control for other macroeconomic factors associated with acquisition activity. Previous research finds a strong positive association between acquisition activity and stock prices, stock returns, or Tobin's q.[6] Shleifer and Vishny (2003) contend that this result is consistent with acquisition activity being driven in part by stock market misvaluations (i.e., overvalued bidders). Consistent with this explanation, Dong, Hirshleifer, Richardson, and Teoh (2003) find a negative association between acquisition activity and the ratio of residual-income value to price. Likewise, Rhodes-Kropf, Robinson, and Viswanathan (2004) find that merger intensity is positively correlated with short-run deviations in valuation from long-run valuation trends (i.e., short-term over-valuations). In contrast, Caballero and Hammour (2000) argue that during periods of high security prices, sellers become more liquid and thus are more willing to participate in acquisitions. We control for these effects by including the average stock return of the NYSE, AMEX, and NASDAQ for the four quarters preceding quarter *t* (*RET*). Consistent with previous studies, we expect a positive coefficient for *RET*.

Golbe and White (1988) contend that the cost of capital has two potentially competing influences on acquisition activity. Because higher interest rates increase the cost and reduce the profitability of acquisitions, there may be a negative relationship

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[5] We replicated our tests using two alternative definitions of *CG*. In lieu of the top capital gains rate for individuals, we defined *CG* as (1) the top ordinary individual tax rate (i.e., the short-term capital gains tax rate) and (2) the top corporate tax rate. We find no consistent association between acquisition activity and either of these alternative tax rates.

[6] For example, see Nelson, 1959; Steiner, 1975; Beckenstein, 1979; Chung and Weston, 1982; Melicher, Ledolter, and D'Antonoio, 1983; Guerard, 1985; Becketti, 1986; Golbe and White, 1988.

between interest rates and acquisition activity. In contrast, there may be higher numbers of potential takeover targets during periods of high interest rates because of firm liquidity problems, and this could induce a positive relationship between interest rates and acquisition activity. Consistent with the competing hypotheses for the effect of interest rates, prior evidence on the association between interest rates and acquisition activity is mixed. Golbe and White find no significant association between acquisition activity and the interest rates on Aaa-rated corporate bonds, whereas Chung and Weston (1982), Melicher, Ledolter, and D'Antonio (1983), and Becketti (1986) find a negative relationship between interest rates and acquisitions. In contrast, Beckenstein (1979) finds a positive association between annual mergers and interest rates, and Chung and Weston (1982) find a positive association between acquisition activity and the ratio of short- to long-term bond yields and the difference in low and high-grade bond yields. We include the yield on Aaa-rated bonds (*AAA*), the ratio of one-year to ten-year interest rates on treasury bonds (*STINT/LTINT*), and the difference in the yields of Baa-rated bonds and ten-year treasury bonds (*INTRISK*) to control for the effects of cost of capital on acquisition activity.

Previous studies also document an association between acquisition activity and industrial production. For example, Steiner (1975) and Chung and Weston (1982) find a positive association between annual acquisition activity and gross national product (GNP). Prior research generally interprets this finding as consistent with acquisitions occurring during periods of high economic activity. We include GNP denominated in 1996 dollars for the year preceding quarter *t* (*GNP*) to control for the effects of industrial production on acquisition activity.[7] Market liquidity in the form of free cash flows may also be associated with acquisition activity. Specifically, Jensen (1986) predicts that

[7] In sensitivity analysis we include the change in GNP during the year preceding quarter *t* as an additional control for the effects of industrial production. Results (not tabulated) are consistent with those presented in the tables.

mergers are more likely in industries with large amounts of free cash flows. We include the change in market cash flows ($\Delta CASH$), defined as the change in annual corporate net cash flows denominated in 1996 dollars and reported by the U.S. Department of Commerce's Bureau of Economic Analysis, to control for the effects of increased market free cash flows on acquisitions.

Finally, Mitchell and Mulherin (1996) study industry-level patterns in acquisition activity and demonstrate that industry shocks explain much of the acquisition activity during the 1980s.[8] They identify industries experiencing shocks or high economic change as those industries with large positive or negative abnormal sales growth relative to the market mean. We incorporate the effects of industry shocks on aggregate acquisition activity by including, *INDSHCK*, defined as the standard deviation in sales growth across industries for the two years preceding quarter *t*. This proxy is intended to distinguish periods characterized by high variance in growth across industries. If increased acquisition activity occurs during periods of high industry shocks, we anticipate a positive association between acquisition activity and *INDSHCK*.[9] [10]

II. Sample Selection and Descriptive Statistics

We develop our sample from the domestic firms listed on the NYSE, AMEX, and NASDAQ and deleted from the *CRSP* Tapes due to acquisition from 1973 through 2001. We match this sample with firms deleted from *Compustat* due to acquisition to generate a

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[8] Mulherin and Boone (2000) and Andrade, Mitchell and Stafford (2001) provide similar evidence for acquisitions in the 1990s.

[9] Mitchell and Mulherin (1996) also use employment growth to identify industry shocks. In sensitivity analysis, we define *INDSHCK* as the standard deviation in employment growth across industry for the two years preceding quarter *t*. Results (not reported) are similar to those presented in the tables.

[10] In sensitivity analysis, we included controls for the effects of hostile or unsolicited bids on acquisition activity. Using data reported in Schwert (2000), we included variables representing the percentage of total takeover bids reported in the Wall Street as being hostile and alternatively, the percentage of takeover bids that were unsolicited. Results (not reported) are similar to those presented in the tables.

sample of 7,456 acquisitions.[11] During the sample period there were five different long-term capital gains tax rate regimes, ranging from a high of 35% from 1973 through 1978 to a low of 20% from 1982 to 1986 and from mid 1997 to 2001. Each change in the capital gains tax rate during the sample period was effective at the end of each calendar year with the exception of the tax rate change in 1997, which was effective as of May 6, 1997. Because the effective date of the 1997 change occurs in the middle of the quarter, we exclude the 2nd quarter of 1997 from our analyses.[12] Thus, our final sample includes 7,358 acquisitions over 115 quarters.

Table 2 presents the number of acquisitions by tax regime. Because the regimes vary in length, Table 2 also presents the average number of acquisitions by calendar quarter as well as the number of acquisitions deflated by the number of listed firms and the market value of listed firms at the end of each calendar quarter. Overall, there is a mean (median) of 64 (59) acquisitions per quarter which translates to a mean (median) of 1.08 (0.98) percent of publicly traded firms acquired per quarter and a mean (median) of 0.72 (0.61) percent of the market value of publicly traded firms acquired per quarter. In Table 2, the changes in the mean acquisition activity across tax regimes are generally consistent with our tax hypothesis. Namely, acquisition activity increases (decreases) with each tax rate decrease (increase). When we measure acquisition activity as the percentage of listed firms' value acquired, each change in activity across tax regimes (i.e., four of four) is statistically significant (Wilcoxon Rank Sum Test, $p<.05$) in the predicted direction. When we measure acquisition activity as the percentage of listed firms acquired, each change in activity across tax regimes is in the predicted direction, but only the changes after 1973-1978 regime and the 1987-5/6/1997 regime (i.e., two of

[11] We identify acquisitions using the drop code supplied by Compustat augmented by acquisition information from Securities Data Corporation.

[12] Results are not changed if we include this quarter in the analysis and define *CG* using the capital gains tax rate preceding or following the rate change.

four) are statistically significant (Wilcoxon Rank Sum Test, p<.05). Although caution should be used in interpreting descriptive data without controls for other determinants of acquisition activity, Table 2 provides some preliminary evidence of the predicted relationship between capital gains tax rates and acquisition activity.

Insert Table 2 here

Table 3 reports descriptive data for the dependent and independent variables used in the regression analysis segregated by periods of high and low acquisition activity. We define high (low) periods of acquisition activity as calendar quarters in the top (bottom) quartile of quarterly acquisition activity for the sample period. We identify significant differences across subsamples using the Wilcoxon Rank Sum test (p <= .05). Consistent with the evidence in Table 2, high acquisition activity quarters have significantly lower capital gains tax rates than low acquisition activity quarters (i.e., a mean *CG* of .227 for high acquisition activity quarters versus a mean *CG* of .319 for low acquisition activity quarters). Table 3 also indicates significant differences in *GNP* and *INDSHCK* across periods of high and low acquisition activity. These results are consistent with recent studies investigating merger trends that indicate a positive association between acquisition activity and GNP and industry shocks.

III. Results

Table 4 presents the estimated coefficients (probability levels) for our two regression models.[13] In Model 1, we define *ACQ* as the percentage of publicly traded firms acquired in quarter *t*. In Model 2, we define *ACQ* as the percentage of market value

[13] We also estimated the regressions after eliminating potentially influential observations identified using the Belsley, Kuh, and Welsch (1980) diagnostics. Regression results excluding these observations (not reported) are not qualitatively different from the results reported in Table 4.

of publicly traded firms acquired in quarter *t*. Both the Durbin-Watson and the Breusch-Godfrey test indicate the presence of serial correlation in OLS regressions for Model 1. Thus, we present regression estimates for both Model 1 and Model 2 using the Prais-Winsten transformation (Prais and Winsten, 1954) to correct for first-order serial correlation.[14]

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insert Table 4 here

Consistent with expectations, the estimated coefficient for *CG* is negative and statistically significant in both models. As predicted by the lock-in effect, this finding suggests that, on the margin, the volume of acquisition activity is inversely related to the capital gains tax rate. To estimate the economic significance of this effect, we evaluate changes in the capital gains tax rate for Model 1 at the sample median. A five percentage point decrease in the capital gains tax rate (e.g., from the sample median of 28 percent to 23 percent), *ceteris paribus*, would increase quarterly acquisition activity from 1.01 percent to 1.23 percent. Evaluated at the sample mean of 5,738 publicly traded firms, this evidence suggests that a five percentage point decrease in the capital gains tax rate, *ceteris paribus*, would increase the *annual* number of acquisitions by approximately 51 acquisitions.

With respect to our control variables, the estimated coefficients for *STINT/LTINT* and *GNP* are positive and statistically significant across both regression models. Similar to prior research, these results suggest that interest rates and industrial production are associated with acquisition activity. The estimated coefficients for *RET* and *INTRISK* are

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[14] The Durbin-Watson test on the transformed regression indicates that the Prais-Winsten transformation successfully corrected for the serial correlation in Model 1. While the Durbin-Watson statistic was not statistically significant for Model 2, for consistency we present regression results for Model 2 based upon Prais-Winsten transformation. Results from using OLS regression for Model 2 are not qualitatively different from those presented in Table 4. Probability levels were obtained using White's (1980) robust variance estimates.

positive and negative, respectively, but are not statistically significant at conventional levels in either model. Likewise, the estimated coefficient for *AAA* is negative and statistically significant in Model 1, whereas the estimated coefficient for *INDSHCK* is positive in both models, but only marginally significant in Model 2.

A. Sensitivity Analyses

Because the effect of the capital gains tax on taxable acquisition activity motivates our analysis, we perform supplemental analysis to verify that the inverse relationship between acquisition activity and the capital gains tax rate is attributable to taxable acquisitions. This analysis is important from a research design perspective because it provides an opportunity to test whether the "tax effect" in Table 4 is limited to the sample suggested by theory (i.e., taxable acquisitions). To begin, we re-estimate our regression analysis separately for quarterly taxable and nontaxable acquisition activity. We define taxable (nontaxable) acquisition activity as the percentage of publicly traded firms acquired in taxable cash (nontaxable stock) acquisitions in quarter *t*.[15] We identify the taxability of sample acquisitions using the form of payment made to the shareholders of the acquired firm (generally cash is paid to shareholders in taxable acquisitions whereas stock is exchanged in nontaxable acquisitions). Tax status was verified in *CCH Capital Changes Reporter*. We identified the tax status for 5,938 acquisitions (out of the 7,358 sample acquisitions used in our primary analysis), and 3,402 (2,536) were taxable (nontaxable).

Table 5 presents the number of taxable and nontaxable acquisitions by tax regime. Shifts in the mean *taxable* acquisition activity across tax regimes are generally consistent

[15] The Internal Revenue Code dictates that shareholders of the acquired firm pay capital gains taxes on realized gains when bidding firms make cash payments for their stock. In contrast, gains may qualify for indefinite deferral when shareholders of the acquired firm exchange their shares for stock of the bidding firm. The fair value of other (nonqualifying) forms of consideration, such as debt instruments, is generally treated as a cash payment.

with expectations – i.e., taxable acquisition activity generally increases (decreases) with each tax rate decrease (increase). When we measure acquisition activity as the percentage of listed firms' value acquired in taxable acquisitions, each change in activity across tax regimes is in the predicted directed and three of four changes are statistically significant (Wilcoxon Rank Sum Test, $p<.05$) – i.e., only the change after the 1987-5/6/1997 regime is not statistically significant. When we measure acquisition activity as the percentage of listed firms acquired in taxable acquisitions, three of the four changes in activity across tax regimes is in the predicted direction, but only the changes after 1973-1978 regime and the 1987-5/6/1997 regime are statistically significant (Wilcoxon Rank Sum Test, $p<.05$). We find no similar pattern for tax-free acquisition activity.

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insert Table 5

Table 6 presents the regression results using measures of taxable acquisition activity (*TX*) and nontaxable acquisition activity (*TF*) as the dependent variables for each of the regression models (Model 1 and Model 2).[16] Consistent with expectations, the coefficient for *CG* is negative and significant for taxable acquisition activity in both models (i.e., there is an inverse relationship between capital gain tax rates and taxable acquisition activity). We find no similar relationship for nontaxable acquisition activity in either model. These results, combined with those in Table 4, suggest that the association between aggregate activity and capital gains tax rates is attributable to changes in the consummation of taxable acquisitions. In addition to being consistent with expectations, this evidence provides additional comfort that some unidentified macro-economic factor does *not* explain the relationship between aggregate acquisition activity

[16] We present the regression results in Table 5 after eliminating potentially influential observations identified using the Belsley, Kuh, and Welsch (1980) diagnostics. Regression results including these observations (not reported) are not qualitatively different from the results reported in Table 5.

and the capital gains tax rate. If this were the case, we would expect to find similar results for the taxable and nontaxable regressions. In contrast, we find a significant negative association between the capital gains tax rate and taxable acquisition activity only. This evidence implies that for an unidentified macro-economic factor to explain the previous results such factor would have to be (a) correlated with the capital gains tax rate and (b) restricted to influencing taxable acquisitions. Other than tax policy, we are unaware of any nontax factor that would be systematically correlated with tax rates but uncorrelated with nontaxable acquisition activity.

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insert Table 6

It is possible that our results may be influenced by firms *timing* acquisitions around tax rate changes (e.g., accelerating acquisitions before a pending capital gains tax rate increase) instead of the capital gains tax rate actually influencing the volume of acquisition activity. Indeed, Ayers, Lefanowicz, and Robinson (2004) find evidence of an increase (decrease) in taxable acquisitions prior to (following) the capital gains tax rate increase enacted with the Tax Reform Act of 1986. They find similar but less pronounced effects associated with the tax rate decrease enacted with the Taxpayer Relief Act of 1997. To assess whether this study's results may be explained by a timing effect, we re-estimate the analysis in Table 4 after eliminating the quarter preceding and following a tax rate change. Results (not presented) are similar to those presented in Table 4. In particular, the coefficient for *CG* is negative and significant ($p = .01$ and .00, respectively) in both models.

Next, to test whether the relationship between the *individual* capital gains tax rate and acquisition activity varies with the tax characteristics of target firm shareholders (i.e., individuals subject to the *individual* capital gains tax rate versus institutions), we replicate the analyses in Table 4 after limiting the sample to firms with institutional

ownership (a) of less than 40 percent and alternatively, (b) of more than 60 percent. Previous research (Ayers, Cloyd, Robinson, 2002, Dhaliwal, Li, and Trezevant, 2003, Ayers, Lefanowicz, and Robinson, 2003, etc.) has used institutional ownership to proxy for the likelihood that the price-setting shareholder in a particular stock is not an *individual* taxpayer. We obtain institutional ownership data from the CDA Spectrum database and represent institutional ownership as the percentage of common stock held by institutional investors at the beginning of each quarter. CDA compiles common stock ownership by institutions at the end of each calendar quarter based on SEC Form 13F filings. Due to the lack of institutional ownership data prior to 1980, sample observations for this analysis begin in 1980. For the low institutional ownership analysis, we define *ACQ* as the percentage of publicly traded firms (or alternatively, the percentage of market value of publicly traded firms) with institutional ownership less than 40 percent that were acquired during a calendar quarter. Likewise, for the high institutional ownership analysis, we define *ACQ* as the percentage of publicly traded firms (or alternatively, the percentage of market value of publicly traded firms) with institutional ownership exceeding 60 percent that were acquired during a calendar quarter.

As anticipated, results (not reported) for the low institutional ownership analysis (i.e., the high individual ownership sample) are consistent with those reported in Table 4. Specifically, we find a negative and significant coefficient for *CG* ($p < .01$) in models (1) and (2). In contrast, we find no significant association between the *individual* capital gains tax rate and acquisition activity for high institutional ownership firms. In sum, results suggest that the lock-in effect associated with the *individual* capital gains tax rate is restricted to those firms whose shareholders are more likely to be subject to that rate (i.e., individual taxpayers).[17]

[17] In additional analysis, we estimate the regressions for low and high institutional ownership firms separately for taxable and nontaxable acquisitions. As expected, we find a significant negative association

Finally, we investigate whether our regression results are sensitive to our choice of proxy for market valuation trends (i.e., average stock returns of the NYSE, AMEX, and NASDAQ for the four quarters preceding quarter *t*). We re-estimate our regressions including the quarterly mean and standard deviation of market-to-book ratios for publicly traded firms as well as the mean price-to-earnings ratio for publicly traded firms. Results (not reported) are comparable to those presented in Table 4 – i.e., the estimated coefficient for *CG* is negative and statistically significant ($p<.01$) in each specification.

B. Industry Analyses

Recent studies (Mitchell and Mulherin, 1996; Mulherin and Boone, 2000; Andrade, Mitchell, and Stafford, 2001; Andrade and Stafford, 2004) suggest that industry factors (e.g., industry shocks) explain a large portion of the cross-temporal variation in acquisition activity. One disadvantage of our primary analyses is that our quarterly time series may not adequately control for industry factors. To account for this possibility, we re-estimate our primary analyses defining acquisition activity as (a) the annual percentage of acquisitions per two-digit SIC industry (i.e., the number of acquisitions in two-digit SIC industry *j* in year *t*, deflated by the number of firms publicly listed in industry *j* in year *t*) and (b) the annual value of acquisitions per two-digit SIC industry (i.e., the value of acquisitions in industry *j* in year *t*, deflated by the value of firms publicly listed in industry *j* in year *t*). Similar to our primary analyses, we model annual industry acquisition activity as a function of the capital gains tax rate and variables that represent market factors previously hypothesized to be associated with acquisition activity. Because this analysis uses annual observations, we re-define each of our existing control variables in annual terms. For example, we redefine *RET* to equal the average stock

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between the capital gains tax rate and acquisition activity only for taxable acquisitions of low institutional ownership firms.

return of the NYSE, AMEX, and NASDAQ for the *year* preceding *year t*. We estimate the following annual industry level regression:

$$INDACQ_{jt} = \gamma_0 + \gamma_1 CG_t + \gamma_k X_{kt} + \varepsilon_t \quad (2)$$

where:

$INDACQ_{tt}$ = The number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in industry *j* in year *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ in industry *j* during year *t*.

CG_t = the top individual capital gains tax rate during year *t*, and

X_k = a vector of *k* explanatory variables representing macroeconomic and industry-specific variables previously found to be associated with acquisition activity.

Table 7 provides complete variable definitions for the variables used in this analysis. Following Mitchell and Mulherin (1996), Andrade, Mitchell, and Stafford (2001), and Andrade and Stafford (2004), we incorporate the following industry-specific factors that may influence acquisition activity. We include industry *j*'s cash flow (*INDCASH)* and *Q* in year *t* to control for industry business conditions and growth opportunities, respectively. We include industry *j*'s sales growth in the two years preceding year *t* (*SALESGR*) to identify shocks to the industry.[18] Andrade, Mitchell, and Stafford (2001) find that after 1988 deregulated industries account for a sizeable portion of acquisition activity. We include an indicator variable (*DEREG*) equal to one for the period beginning three years prior and ending 6 years after deregulation in industry *j*, and zero otherwise. We classify the two-digit SIC industries containing the following industry subgroups as experiencing significant deregulation during the sample period: airlines (1978), broadcasting (1984 and 1996), entertainment (1984), natural gas (1978),

[18] In sensitivity analysis we include a separate industry shock variable defined as the absolute value of the difference in *SALESGR* less the mean *SALESGR* for industry *j* during the sample period. Results incorporating this additional control variable are consistent with those presented in the tables, and the coefficient for this alternative control is insignificant.

trucking (1980), banks and thrifts (1994), utilities (1992), and telecommunication (1996). Finally, Andrade and Stafford (2004) find that the level of industry concentration, defined as the natural log of the sum of squared market shares (based on sales), is negatively associated with industry acquisition activity. We include a similar control variable (*INDCONC*) to control for any effects that industry concentration or structure may have on industry acquisition activity.

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insert Table 7

In this analysis we restrict sample industries to those including more than ten firms at the end of the year. In addition, we eliminate observations for 1997 because the effective date of the 1997 tax rate change occurs mid-year. These restrictions produce a sample of 1,610 industry-year observations that spans 63 two-digit SIC industries over 29 years and includes 94 percent of the total acquisitions in our primary sample. We estimate fixed-effect regressions that allow for clustering of observations at the industry level and first-order autocorrelation.[19]

Table 8 presents our regression analyses of industry acquisition activity.[20] In Model 1, *INDACQ* is defined as the percentage of publicly traded firms acquired in industry *j* in year *t*. In Model 2, we define *INDACQ* as the percentage of market value of publicly traded firms acquired in industry *j* in year *t*. Similar to previous analyses, the estimated coefficient for *CG* is negative and statistically significant in both models. In

[19] We also estimated both models with fixed effect regressions before adjusting for autocorrelation and with random-effects regression. Although random effects estimators are more efficient, fixed effects estimators yield consistent estimates when unobserved effects may be correlated with independent variables. The regression results using these alternative procedures are not qualitatively different from those presented in Table 8.

[20] Although we have 1,610 annual industry level observations, the fixed effects regressions are estimated with 1,547 degrees of freedom because the regressions incorporate the panel-by-panel Cochrane-Orcutt estimates of autocorrelation. Hence, the degrees of freedom are reduced by the number of industry groups.

addition, the estimated annual effect of *CG* on industry acquisition activity is similar to what one might expect from our quarterly aggregate analysis. For example, the estimated coefficient for *CG* generated using annual industry acquisition activity in Table 8 (-0.206) is approximately four times the estimated coefficient generated using quarterly acquisition activity in Table 4 (-0.044).

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insert Table 8

With respect to our control variables, the estimated coefficient for *STINT/LTINT*, *SALESGR*, and *INDSHCK* are positive and statistically significant across both regression models. Similar to prior research, these results suggest that interest rates, periods of high industry growth, and industry shocks are associated with acquisition activity. The estimated coefficients for *RET* and *INTRISK* are positive and negative, respectively, but are not statistically significant at conventional levels in either model. Likewise, the estimated coefficient for *AAA* is negative and statistically significant in Model 1, whereas the estimated coefficient for Δ*CASH* is positive in both models, but only statistically significant in Model 1.

As a final robustness check, we re-estimated the regressions in Table 8 separately for taxable and nontaxable acquisitions.[21] Results (not tabulated) are consistent with those previously reported. We find a significantly negative association between the capital gains tax rate and annual taxable acquisitions by industry. We find no similar relation between the capital gains tax rate and annual nontaxable acquisitions by industry.

[21] We estimated these regressions using both fixed and random effects allowing for clustering within industry and adjusted for autocorrelation.

IV. Conclusion

This study investigates whether the trading volume hypothesis predicted by the lock-in effect extends to corporate acquisitions. We analyze quarterly acquisition activity using acquisitions of publicly traded firms acquired from 1973 through 2001. In additional analysis, we analyze annual acquisition activity by industry. We model the percentage of firms acquired (and percentage of market value acquired) as a function of the capital gains tax rate for individuals and other factors hypothesized to be associated with acquisition activity. Consistent with expectations, we find a significant negative association between the acquisition activity and the capital gains tax rate for individual investors. Supplemental analysis confirms that this association is attributable to the time series variation in taxable, but not nontaxable, acquisitions and to variation in acquisition activity of firms primarily held by individual taxpayers.

This study makes several contributions. First and foremost, this study expands our understanding of the macro-economic determinants of acquisition activity. Results suggest that, *ceteris paribus*, capital gains tax policy is an important market influence on corporate acquisition activity. Consistent with the lock-in effect, our findings imply that capital gains taxes represent significant transaction costs that, on the margin, decrease acquisition activity during periods of high capital gains taxation. Results are robust whether we define acquisition activity in aggregate or by industry. Accordingly, our evidence suggests that macroeconomic factors, such as capital gains tax policy, may in part explain a portion of the cross-temporal variation in acquisition activity by industry.

This study is closely related to prior research investigating the effects of capital gains taxes on individual corporate acquisitions. Prior research has found that the capital

gains tax is an important influence in the price and structure (i.e., taxable cash-for-stock versus nontaxable stock-for-stock acquisitions) of corporate acquisitions. Our results suggest that the capital gains tax, on the margin, may also influence aggregate corporate acquisition activity.

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Table 1
Variable Definitions

Dependent variable

Variable	Definition
ACQ	The number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in quarter *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ during quarter *t*. Alternatively, the value of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in quarter *t*, deflated by the value of firms traded on the NYSE, AMEX, and NASDAQ during quarter *t*.

Independent Variables

Variable	Definition
CG	The maximum long-term capital gains tax rate for individual investors during quarter *t*.
RET	average stock returns of the NYSE, AMEX, and NASDAQ for the four quarters preceding quarter *t*.
STINT/LTINT	the ratio of the one-year interest rate on Treasury Bonds to the ten-year interest rate on Treasury Bonds for quarter *t*.
AAA	yield on Aaa-rated bonds for quarter *t*.
INTRISK	difference in the yields of Baa-rated bonds and ten-year treasury bonds for quarter *t*.
GNP	*GNP* during the year preceding quarter *t*.
$\Delta CASH$	change in corporate net cash flows from the calendar year preceding quarter *t* to the calendar year including year *t*. Annual corporate net cash flows are denominated in 1996 dollars and reported by the U.S. Department of Commerce's Bureau of Economic Analysis.
INDSHCK	standard deviation in sales growth across industries for the two years preceding quarter *t*.

Table 2
Distribution of Acquisition Activity by Tax Regime

Tax Regime	Maximum Capital Gains Tax Rate	Total Acquisitions	Quarterly Average	Quarterly Average	
				Percentage of Listed Firms Acquired	Percentage of Listed Firms Acquired by Value
1973 – 1978	35%	798	33.3	0.70	0.21
1979 – 1981	28%	561	46.7	1.01	0.68
1982 – 1986	20%	1,143	57.2	1.03	0.93
1987 – 5/6/1997	28%	2,498	60.9	0.96	0.64
5/7/1997 – 2001	20%	2,358	131.0	1.93	1.35
Overall		7,358	64.0	1.08	0.72

Notes: Distribution of 7,358 acquisitions of publicly traded firms (firms dropped by *CRSP* and *Compustat* due to acquisition) by tax rate regime over the period 1973 to 2001. We also present the number of acquisitions as a percentage of listed firms calculated by deflating the number of publicly held firms acquired by the number of firms listed on *CRSP* and *Compustat*. We calculate the value of acquisitions as a percentage of the value of listed firms by deflating the market value of publicly held firms acquired (firms dropped by *CRSP* and *Compustat* due to acquisition) by the value of firms listed on *CRSP* and *Compustat*. The tax rate represents the maximum long-term capital gains tax rate during the regime. Changes in the tax rates were effective at the end of each calendar year with the exception of the change in 1997, which was effective as of May 6, 1997. Because the effective date of the 1997 change occurs in the middle of the quarter, we exclude the 2nd quarter of 1997 from our analyses.

Table 3
Descriptive Statistics for Regression Variables in Aggregate and by Acquisition Activity

Variables	Significant [a] Differences	Mean	Standard Deviation	25% Quartile	Median	75% Quartile
ACQ		0.011	0.005	0.007	0.010	0.013
High Acquisition Activity		0.018	0.003	0.015	0.018	0.019
Low Acquisition Activity		0.006	0.001	0.005	0.006	0.006
CG		0.268	0.055	0.20	0.28	0.28
High Acquisition Activity	HAA<LAA	0.227	0.043	0.20	0.20	0.28
Low Acquisition Activity		0.319	0.035	0.28	0.35	0.35
RET		0.145	0.183	0.021	0.164	0.273
High Acquisition Activity	HAA ≈ LAA	0.153	0.196	-0.001	0.214	0.301
Low Acquisition Activity		0.093	0.201	-0.051	0.142	0.171
STINT/LTINT		0.884	0.154	0.803	0.883	0.984
High Acquisition Activity	HAA ≈ LAA	0.900	0.141	0.864	0.914	0.979
Low Acquisition Activity		0.815	0.2001	0.627	0.790	0.984
AAA		0.074	0.029	0.056	0.068	0.087
High Acquisition Activity	HAA ≈ LAA	0.057	0.017	0.051	0.055	0.061
Low Acquisition Activity		0.060	0.017	0.044	0.063	0.073
INTRISK		*0.020*	*0.005*	*0.016*	*0.019*	*0.023*
High Acquisition Activity	HAA ≈ LAA	0.021	0.006	0.016	0.021	0.026
Low Acquisition Activity		0.020	0.004	0.017	0.020	0.022
GNP		*62.721*	*15.699*	*49.646*	*61.209*	*74.311*
High Acquisition Activity	HAA>LAA	80.750	12.986	77.035	84.461	91.171
Low Acquisition Activity		54.039	13.744	41.682	43.633	68.107
Δ*CASH*		0.079	0.081	0.027	0.078	0.140
High Acquisition Activity	HAA ≈ LAA	0.053	0.081	-0.027	0.068	0.120
Low Acquisition Activity		0.095	0.080	0.033	0.067	0.173
INDSHCK		0.061	0.027	0.044	0.058	0.072
High Acquisition Activity	HAA>LAA	0.073	0.033	0.052	0.068	0.083
Low Acquisition Activity		0.047	0.017	0.031	0.046	0.059

Notes: Descriptive statistics for a time series consisting of 115 calendar quarters from 1973 through 2001. High (Low) acquisition activity observations include calendar quarters in the top (bottom) quartile of acquisition activity during the sample period. Table 1 provides variable definitions.

[a] Differences between the high an low acquisition activity quarters are significant using a Wilcoxon Rank Sum test ($p<.05$).

Table 4
Time Series Regression of Quarterly Acquisition Activity on Capital Gains Tax Rates and Other Macroeconomic Factors Associated with Acquisition Activity

Variables	Expected Sign	Coefficient Estimate (Probability Level) Model 1	Model 2
Intercept	?	0.002 (.37)	-0.002 (.79)
CG	-	-0.044 (.00)	-0.035 (.00)
RET	+	-0.001 (.55)	0.001 (.34)
STINT/LTINT	+	0.012 (.00)	0.010 (.00)
AAA	-	-0.043 (.05)	0.001 (.51)
INTRISK	-	0.017 (.59)	-0.012 (.44)
GNP	+	0.001 (.01)	0.001 (.00)
$\Delta CASH$	+	0.004 (.18)	-0.003 (.73)
INDSHCK	+	0.003 (.41)	0.032 (.02)
N		115	115
Adj. R^2		0.37	0.52

Notes: Regressions of quarterly acquisition activity (*ACQ*) on variables representing the top individual capital gains tax rate during quarter *t* and other macroeconomic factors. The estimated regression is:

$$ACQ_t = \gamma_0 + \gamma_1 CG_t + \gamma_k X_{kt} + \varepsilon_t \quad (1)$$

In Model 1 the dependent variable, *ACQ*, represents the number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in quarter *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ during quarter *t*. In Model 2, the dependent variable, *ACQ*, is defined as the percentage of market value of NYSE, AMEX, and NASDAQ firms acquired in quarter *t*. The capital gains tax variable, *CG*, represents the maximum capital gains tax rate in the quarter that the acquisition was consummated. Table 1 defines all other regression variables. The regressions were estimated after using the Prais-Winsten (1954) transformation to correct for first-order serial correlation. We determine probability levels using White's (1980) robust variance estimates and one-tailed *t*-tests for coefficients with a predicted sign and two-tailed *t*-tests for all other coefficients. Our time series consists of 115 calendar quarters from 1973 through 2001.

Table 5
Distribution of Sample Taxable and Nontaxable Acquisitions by Tax Regime

Tax Regime	Capital Gains Tax Rate	Taxable Acquisitions			Tax-free Acquisitions		
			Quarterly Mean			Quarterly Mean	
		N	Percent Acquired	Percent of Value	N	Percent Acquired	Percent of Value
1973 – 1978	35%	385	0.34	0.10	304	0.27	0.09
1979 – 1981	28%	245	0.44	0.28	110	0.20	0.18
1982 – 1986	20%	512	0.46	0.61	182	0.16	0.15
1987 – 5/6/1997	28%	1,184	0.46	0.28	925	0.35	0.25
5/7/1997 – 2001	20%	1,076	0.89	0.30	1,015	0.82	0.82
Overall		3,402	0.50	0.30	2,536	0.36	0.28

Notes: Distribution of 5,938 acquisitions of publicly traded firms (firms dropped by *CRSP* and *Compustat* due to acquisition) over the period 1973 to 2001 by tax rate regime and the tax status of the acquisition. We determined tax status for each acquisition by evaluating the form of consideration (cash payments are taxable whereas stock exchanges are generally not taxable) and then verifying the tax status in *CCH Capital Changes Reporter*. We calculate relative levels of acquisition activity based upon the number of acquisitions as percentages of number and total value of listed firms at the end of each quarter. For example, we deflate the number of publicly held firms acquired in taxable acquisitions by the number of public firms listed on *CRSP* and *Compustat*. The tax rate represents the maximum long-term capital gains tax rate during the regime. Changes in the tax rates were effective at the end of each calendar year with the exception of the change in 1997, which was effective as of May 6, 1997. Because the effective date of the 1997 change occurs in the middle of the quarter, we exclude the 2nd quarter of 1997 from our analyses.

Table 6
Time Series Regression of Quarterly Acquisition Activity on Capital Gains Tax Rates and Other Macroeconomic Factors: Separate Regressions for Taxable and Nontaxable Acquisitions

Variables	Expected Sign	Coefficient Estimate (Probability Level)			
		Model 1		Model 2	
		TX	*TF*	*TX*	*TF*
Intercept	?	0.004	-0.006	0.017	-0.017
		(.50)	(.08)	(.00)	(.00)
CG	-	-0.022	-0.003	-0.036	0.040
		(.02)	(.63)	(.00)	(.60)
RET	+	-0.001	0.001	-0.002	0.003
		(.66)	(.50)	(.95)	(.01)
STINT/LTINT	+	0.007	0.008	0.001	0.010
		(.01)	(.00)	(.50)	(.00)
AAA	-	-0.032	-0.047	0.004	-0.025
		(.06)	(.00)	(.57)	(.05)
INTRISK	-	-0.020	0.010	-0.112	0.128
		(.36)	(.78)	(.05)	(.98)
GNP	+	0.001	0.001	-0.001	0.001
		(.10)	(.00)	(.93)	(.00)
$\Delta CASH$	+	0.002	0.003	0.002	-0.004
		(.30)	(.16)	(.28)	(.55)
INDSHCK	+	-0.001	0.010	0.018	0.008
		(.55)	(.15)	(.07)	(.24)
N		115	115	115	115
Adj. R^2		0.14	0.47	0.14	0.52

Notes: Regressions of quarterly acquisition activity (*ACQ*) on variables representing the top individual capital gains tax rate during quarter *t* and other macroeconomic factors. The estimated regression is:

$$ACQ_t = \gamma_0 + \gamma_1 CG_t + \gamma_k X_{kt} + \varepsilon_t \quad (1)$$

In Model 1 the dependent variable, *ACQ*, represents the number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in quarter *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ during quarter *t*. In Model 2, the dependent variable, *ACQ*, is defined as the percentage of market value of NYSE, AMEX, and NASDAQ firms acquired in quarter *t*. The capital gains tax variable, *CG*, represents the maximum capital gains tax rate in the quarter that the acquisition was consummated. Table 1 defines all other regression variables. The regressions were estimated after using the Prais-Winsten (1954) transformation to correct for first-order serial correlation. We determine probability levels using White's (1980) robust variance estimates and one-tailed *t*-tests for coefficients with a predicted sign and two-tailed *t*-tests for all other coefficients. We use a two-tailed t test for *CG* for the nontaxable acquisition activity regressions. Our time series consists of 115 calendar quarters from 1973 through 2001.

Table 7
Variable Definitions – Industry Analysis

Dependent variable

Variable	Definition
INDACQ	The number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in industry *j* in year *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ in industry *j* during year *t*. Alternatively, the value of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in industry *j* in year *t*, deflated by the value of firms traded on the NYSE, AMEX, and NASDAQ in industry *j* during year *t*.

Independent Variables

Variable	Definition
CG	The maximum long-term capital gains tax rate for individual investors during year *t*.
RET	average stock returns of the NYSE, AMEX, and NASDAQ for year *t-1*.
STINT/LTINT	the ratio of the one-year interest rate on Treasury Bonds to the ten-year interest rate on Treasury Bonds for year *t*.
AAA	yield on Aaa-rated bonds for year *t*.
INTRISK	difference in the yields of Baa-rated bonds and ten-year treasury bonds for year *t*.
GNP	*GNP* during the year preceding year *t*.
$\Delta CASH$	change in corporate net cash flows from the calendar year preceding year *t* to the calendar year including year *t*. Annual corporate net cash flows are denominated in 1996 dollars and reported by the U.S. Department of Commerce's Bureau of Economic Analysis.
INDSHCK	standard deviation in sales growth across industries for the two years preceding year *t*.

Table 7
Variable Definitions – Industry Analysis (continued)

Independent Variables

Variable	Definition
Q	The sum of book value assets and market value of equity less book value of equity, deflated by book value of assets at the end of year *t* for industry *j*.
INDCASH	Earnings before interest, taxes, depreciation and amortization, deflated by sales at the end of year *t* for industry *j*.
SALESGR	[Sales year *t* for industry *j* / consumer price index (CPI) year t] / [sales year *t-2* for industry *j* / CPI year *t-2*] – 1.
INDCONC	The natural log of the sum[(sales firm *i,* industry *j,* year *t* / total industry *j* sales in year *t*)^2]
DEREG	an indicator variable equal to one for the period beginning three years prior and ending 6 years after deregulation in industry *j*, and zero otherwise. We classify the two-digit SIC industries containing the following industry subgroups as experiencing significant deregulation during the sample period: airlines (1978), broadcasting (1984 and 1996), entertainment (1984), natural gas (1978), trucking (1980), banks and thrifts (1994), utilities (1992), and telecommunication (1996).

Table 8
Fixed Effects Regression of Annual Industry Acquisition Activity on Capital Gains Tax Rates, Other Macroeconomic Factors, and Industry-Specific Factors Associated with Acquisition Activity

Variables	Expected Sign	Coefficient Estimate (Probability Level)	
		Model 1	Model 2
Intercept	?	0.043 (.00)	-0.021 (.51)
CG	-	-0.206 (.00)	-0.161 (.00)
RET	+	0.005 (.19)	0.010 (.17)
STINT/LTINT	+	0.062 (.00)	0.026 (.08)
AAA	-	-0.129 (.05)	0.075 (.71)
INTRISK	-	-0.272 (.18)	-0.346 (.25)
GNP	+	-0.001 (.71)	0.001 (.34)
Δ*CASH*	+	0.022 (.07)	0.022 (.20)
INDSHCK	+	0.061 (.03)	0.101 (.04)
Q	?	0.001 (.91)	-0.002 (.74)
INDCASH	+	0.034 (.13)	0.055 (.14)
SALESGR	+	0.028 (.00)	0.014 (.10)
INDCONC	?	-0.002 (.73)	-0.007 (.87)
DEREG	+	0.005 (.89)	-0.002 (.42)
N		1,547	1,547
Overall Adj. R^2		.14	.04

Table 8 (continued)

Notes: Regressions of annual industry acquisition activity (*INDACQ*) on variables representing the top individual capital gains tax rate during quarter *t*, other macroeconomic factors, and industry-specific factors associated with acquisition activity. The estimated regression is:

$$INDACQ_{jt} = \gamma_0 + \gamma_1 CG_t + \gamma_k X_{kjt} + \varepsilon_t \qquad (2)$$

In Model 1 the dependent variable, *INDACQ*, represents the number of publicly traded firms on the NYSE, AMEX, and NASDAQ acquired in industry *j* in year *t*, deflated by the number of firms traded on the NYSE, AMEX, and NASDAQ in industry *j* during year *t*. In Model 2, the dependent variable, *INDACQ*, is defined as the percentage of market value of NYSE, AMEX, and NASDAQ firms in industry *j* acquired in year *t*. Table 7 defines all other variables. The sample consists of 1,610 industry observations across the period 1973-2001. The fixed effects regressions are based upon 1,547 observations because the panel-by-panel Cochrane-Orcutt estimates of autocorrelation reduce the degrees of freedom by the number of industry groups (63). We estimate fixed-effect regressions that allow for clustering of observations at the industry level and first-order autocorrelation. We determine probability levels using one-tailed *t*-tests for coefficients with a predicted sign and two-tailed *t*-tests for all other coefficients.