

Capital Gains Taxes and IPO Underpricing

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ABSTRACT: We investigate the effect of capital gains taxes on security prices by examining whether returns for initial public offerings (IPOs) reflect tax capitalization and/or lock-in. Initial stock returns for IPOs are a proxy for the short-term taxable gains incurred by sellers who receive initial allocations at the offer price. If initial investors are able to shift the short-term capital gains tax burden from selling their shares to equity issuers or subsequent buyers, then the magnitude of IPO underpricing should increase in short-term capital gains taxes. On the other hand, a historically lower long-term capital gains tax rate offers initial investors the opportunity to reduce capital gains taxes if they delay the sale of their shares. If these tax savings are sufficiently large, then the magnitude of IPO underpricing should decrease in long-term capital gains tax rates. We provide empirical evidence supporting both predictions. Further analysis shows that short-term capital gains rate dampens IPO first-day trading volume and long-term capital gains rate enhances trading volume, consistent with the lock-in effect. Our results suggest that taxes play an important role in IPO underpricing and, more broadly, in valuing securities.

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I. INTRODUCTION

A growing literature suggests that firm value is not independent of shareholder taxes. Capital gains taxes can affect asset prices in two ways: *capitalization* or *lock-in*. Tax capitalization represents the belief that equilibrium prices reflect expected after-tax returns. For example, the price of municipal bonds reflects the tax exemption granted interest paid by these securities. Likewise, if equity prices reflect taxes that investors expect to pay upon the sale of the securities, pre-tax returns will increase with tax rates (Brennan (1970)). Recent empirical evidence supports the proposition that equity prices and trading volume reflect expected taxes on ordinary income or capital gains (i.e., Erickson and Maydew (1999); Guenther and Willenborg (1999); Lang and Shackelford (2000); Ayers, Cloyd, and Robinson (2002); Dhaliwal, Li, and Trezevant (2003); Dhaliwal, Krull, Li and Moser (2005); and Dhaliwal and Li (2006)).

Lock-in is a related argument made by Klein (1999, 2001) and Viard (2000). They posit that equity holders will demand to be compensated for any sale that increases or accelerates expected capital gains taxes. Hence, lock-in refers to the reluctance of holders to sell securities in the absence of price adjustments that offset incremental taxes. The literature has also provided some evidence of this effect (Landsman and Shackelford (1995); Reese (1998); Poterba and Weisbenner (2001); Blouin, Raedy, and Shackelford (2003); Ayers, Lefanowicz, and Robinson (2003); and Ivkovic, Poterba, and Weisbenner (2004)).

We argue that lock-in is related to tax capitalization. If initial investors fully and perfectly capitalize taxes on expected future capital gains, there should be no lock-in effect. The lock-in effect could, however, manifest itself with unexpected price fluctuations (Klein (2001)), changes in expected tax rates (Lang and Shackelford (2000); Dai, Maydew, Shackelford, and Zhang (2006)), changes in holding periods (Blouin, Raedy, and Shackelford (2003)), and in the presence of inadequate initial tax capitalization. In this paper, we explore the extent to which initial IPO returns reflect capitalization of short-term capital gains (ordinary) taxes and the trade-off associated with the expected benefit of deferring realization until gains are subject to lower long-term capital gain tax rates.

Despite a number of empirical studies, it has been difficult to estimate the direction or magnitude of any distortion caused by capital gains taxes. This difficulty stems, in part, from an inability to estimate the marginal trader's taxable gain and tax rate. There has been some progress in research on corporate acquisitions. For example, Ayers, Lefanowicz, and Robinson (2003) argue that the price-setting shareholders in acquired firms are likely to have the largest taxable gains and are most likely to be taxed at the top long-term capital gains tax rate. Consistent with this argument, they report a positive association between the maximum long-term capital gains tax rates and acquisition premiums and conclude that this represents the capital gains tax lock-in effect.

Initial public offerings (IPOs) offer another potential transaction where tax distortions might be isolated. For example, Reese (1998) investigates the lock-in effect by arguing that investors in IPOs are likely to be taxed at the short-term capital gains (ordinary) tax rate until sufficient time elapses to qualify for a long-term holding period. He compares

share prices and volume for two samples of IPOs. One sample consists of IPOs during a period in which short-term capital gains rates exceeded long-term capital gains rates. He reports differential price and volume pressure consistent with IPO investors timing the sale of shares to increase after-tax returns. That is, investors delay the sale of appreciated shares until after they qualify for long-term status and sell depreciated shares prior to long-term qualification.

We argue that initial investors are the likely marginal sellers of IPO shares on the first day of trading. These sellers are likely taxed at the short-term capital gains tax rate, and because they purchased IPO shares at the offer price, their taxable gains are likely well represented by the first-day price reaction. If short-term capital gains taxes are incorporated into equity value, then initial investors will consider potential taxes when evaluating IPO offer prices. High short-term capital gains tax rates should induce higher IPO initial returns because equity issuers (underwriters) will reduce the IPO offer prices to entice initial investors into buying the initial shares (capital gains tax capitalization). Initial investors could also shift short-term taxes to buyers in the secondary market via higher ask prices (capital gains tax lock-in). These arguments suggest that IPO underpricing (first-day returns) could reflect both the capitalization effect and the lock-in effect for initial investors.

Following Reese (1998), we use the IPO setting to investigate the tension between short-term and long-term capital gains tax rates to isolate the lock-in effect. However, instead of examining price and volume reactions around the long-term capital gains qualification dates, we test whether long-term capital gains tax rates are associated with IPO underpricing on the offer date. Because initial holders have a stronger incentive to

delay sales when long-term capital gains tax rates are low, we argue that a negative association between underpricing and long-term capital gains tax rates represents the lock-in effect. Combining these two predictions, we hypothesize that the magnitude of IPO underpricing should increase in the spread between short-term and long-term capital gains tax rates.

We test our predictions by estimating underpricing regressions using a sample of IPOs from 1987 to 2004, a period that includes multiple changes in both long-term and short-term capital gains tax rates. After controlling for the economic factors commonly believed to influence IPO underpricing, we find that short-term capital gains rates are positively associated with IPO underpricing, while long-term capital gains rates are negatively associated with IPO underpricing. In addition, IPO underpricing is positively associated with the spread between individual short-term and long-term capital gains tax rates. We also estimate regressions after limiting our sample to IPOs in adjacent short-term and long-term tax regimes and find that the positive relation between IPO underpricing and the spread between short-term and long-term capital gains tax rates is robust in these sub-periods. Finally, we provide evidence that due to the capital gains tax lock-in effect, the spread between short-term and long-term capital gains tax rates suppresses the supply of initial shares on the secondary market and, thereby, trading volume on IPO days. This volume-based result is important because it provides substantiation that the lock-in effect of capital gains taxes works through the supply of initial shares on the secondary market.

Taken together, these findings are consistent with research indicating that capital gains taxes are capitalized into stock prices and that the magnitude of tax savings

associated with long-term status inhibits sales (capital gains tax lock-in). The net effect of these two forces is that IPO returns are increasing in the spread between short-term and long-term capital gains rates. Our results triangulate with those in a concurrently developed paper by Dai, Maydew, Shackelford and Zhang (2006). Dai et al. examine returns around the Taxpayer Relief Act of 1997 and find evidence of a tax capitalization effect and a lock-in effect around the announcement and effective dates of the legislation.

The remainder of this paper proceeds as follows. In Section II, we discuss the link between the magnitude of IPO underpricing and short-term and long-term capital gains tax rates. Section III describes our sample selection process and empirical methodology. Section IV presents and discusses the empirical results on IPO underpricing and capital gains taxes. Section V presents and discusses the empirical results on IPO first-day trading volume and capital gains taxes. Section VI concludes.

II. UNDERPRICING OF INITIAL PUBLIC OFFERING AND CAPITAL GAINS TAXES

Underpricing of Initial Public Offerings

The average first-day return to IPOs for the period 1987 to 2004 is 21.16 percent.¹ Various theories have been developed to explain why firms and their underwriters set the offer price below what the market is willing to pay (see Ljungqvist (2006) for a thorough summary). A common feature of many IPO pricing models is that they are driven by investor demand: firms want to maximize IPO proceeds, but they need to set a price low enough to encourage enough investors to purchase the entire offering. There are many

¹ Average initial return was calculated using the sample on Jay Ritter's website. Professor Ritter provides monthly initial return data from 1960-2005, with the average initial return for the whole period being 18.82%.

conjectures about why firms set offer prices below true (intrinsic) value. For example, firms may seek to either reward uninformed investors who face a winner's curse problem (Rock (1986)), signal firm quality (and hence attract investors) and future capital raising intentions (Allen and Faulhaber (1989)), or avoid litigation (Tinic (1988)). Alternatively, firms may attempt to reward informed investors (institutions) who regularly participate in IPOs and reveal their information about the offering to the underwriter via the book building process (Benveniste and Spindt (1989)).

Alternative models for IPO underpricing are based on behavioral theories of irrational firm insiders. These models assume that underwriters do not set IPO prices at a level that only attracts sufficient investor demand to sell the shares. Instead, they set the price much lower so that offerings are oversubscribed and IPO shares experience a large price run-up on the first day of trading. This is due to investor irrationality in Loughran and Ritter (2002) where insiders focus on their paper wealth, while Loughran and Ritter (2004) argue that during the 1990s and especially the bubble period of 1999-2000, instead of focusing on maximizing IPO proceeds, issuers focused on attracting analyst coverage and finding underwriters who would provide the executives with allocations in other underpriced IPOs. In both of these frameworks, IPO underwriters choose to set offer prices far below the reservation price of investors. Marginal effects, such as the tax-rate of the investor, are unlikely to play a role in these models because the before-tax return facing investors more than compensates them for their required after-tax return. Thus, if IPO underpricing is driven by the supply-side (underwriter motives and costs, or firm insider irrationality) rather than the demand-side (to induce investors to purchase shares and maximize IPO proceeds), then the impact of taxes may not be important.

In this paper, we assume that firms are attempting to maximize IPO proceeds, and hence the offer price is set by investor demand. Within this class of IPO models, we do not test which specific theory for IPO underpricing is valid; instead we assume that IPO underpricing exists as a rational strategy used to induce demand in the IPO, and we argue that initial investors require the magnitude of IPO underpricing on an after-tax basis. If this is the case, then the before-tax magnitude of IPO underpricing should be a function of capital gains taxes.

In addition to the theories mentioned above, researchers have documented that IPO underpricing and the number of firms going public varies over time with “hot issues” periods of high activity and high initial returns (Ibbotson and Jaffe (1975)), followed by periods of low activity. Because we are examining IPOs across time (tax regimes), we control for the periods of hot and cold cycles in our analysis to isolate any tax regime effect that may exist above and beyond the variation due to investor sentiment or changing investment needs of firms going public.

Role of Capital Gains Taxes in the Underpricing of Initial Public Offerings

When an individual buys an asset and later sells it, the resulting gain or loss qualifies for capital gains treatment. Capital losses offset capital gains, and excess (net) losses offset other taxable income, albeit to a very limited extent. When the underlying assets were held more than one year, any resulting net capital gain qualifies for a preferential (lower) tax rate.² Otherwise, the gain is taxed at the short-term capital gains tax rate, which is the same as the tax rate on ordinary income. The marginal tax rate that an

² With the exception of a brief period during 1997, the long-term holding period of one year did not change during our sample period.

investor faces on the sale of an asset depends jointly upon her income level and the amount of time between the purchase and the sale of the asset. Figure 1 presents the seven separate short-term capital gains tax rates and three different long-term capital gains tax rates in effect since 1986.

The tax capitalization effect proposes that the price an investor is willing to pay for an asset is determined on an after-tax basis. That is, if the tax rate on the expected future appreciation of an asset is too high, investors will offer to pay a lower price for that asset. From the perspective of the initial IPO investors, this is a demand-side argument and if IPO initial investors capitalize capital gains taxes, then IPO offer prices should decrease in capital gains taxes. On the other hand, the capital gains lock-in effect suggests that if investors are taxed on capital gains when they sell an asset, they will hold out for a higher selling price, thereby reducing the supply of the asset. From the perspective of the initial IPO investors, this is a supply-side argument. Initial investors may require higher short-term returns to induce selling at high short-term capital gains tax rates, or initial investors may trade off paying taxes at high short-term capital gains tax rates versus holding the stock and paying taxes at preferential long-term capital gains tax rates. The differential taxation of short-term and long-term capital gains in an IPO setting provides an opportunity to empirically distinguish the capitalization argument from the lock-in argument. Ultimately, whether we have capitalization and/or lock-in depends on how the tax burdens are shared among the equity issuers, initial investors, and secondary market investors.

An important benefit of studying the effect of capital gains taxes on share prices in the IPO setting is that the tax basis of the initial investors is likely known: it is the IPO

offer price. Of course, this benefit relies on the above assumption that the marginal sellers on the first few days after IPOs are those that receive initial allocations, not the original owners of the IPO firms.³ In most other settings, such as mergers and acquisitions (Ayers, Lefanowicz, and Robinson (2003)) and earnings announcements (Blouin, Raedy, and Shackelford (2003)), proxies have to be used for investor capital gains tax bases. These proxies almost certainly contain measurement errors. Landsman and Shackelford (1995) use the actual tax basis to examine confidential shareholder records prior to the RJR Nabisco leveraged buyout, and they find support for the lock-in effect as shareholders with the largest capital gains demanded the highest selling price. Although analyzing the RJR Nabisco transaction in detail provided many insights into investor tax rationality, IPOs provide us with another setting with a known tax basis that varies across many deals over many years.

We investigate the capitalization and lock-in effects of capital gains taxes on IPO underpricing by exploring the relation between the magnitude of IPO underpricing and the short-term capital gains tax rate. As initial investors are the likely marginal sellers for IPOs on the first day (or the first few days) of trading, they are likely taxed at the short-term capital gains tax rate on the amount of the initial returns (or underpricing).

Of course, not all initial investors in IPOs are subject to income taxes. Hanley and Wilhelm (1995) show that institutional investors account for over 70% of IPO

³ In a typical initial public offering, the initial owners of the firm are either bound by underwriter lock-up agreements or by SEC Rule 144 trading volume restrictions, and thus these long-term investors are unable to trade during the first few days after the IPOs. Indeed, Brav and Gompers (2003) document that insiders lock up 93% of their shares during an IPO. SEC Rule 144 trading restrictions apply to owners who received shares that were issued via private placements before the company went public (restricted shares). Rule 144 allows for the sale of restricted shares in limited quantities: shares cannot be sold until they have been owned for at least one year, after which the number of shares sold during a three-month period cannot exceed 1% of the shares outstanding, or the average weekly trading volume. As these owners are also likely subject to underwriter lock-ups, their trading is minimal in the first few days after the IPOs.

allocations, and Boehmer, Boehmer, and Fishe (2006) show equally high institutional participation in IPOs. Institutional investors may be tax-exempt (e.g., retirement plans), taxable (corporations), or mutual funds, which may or may not make investment decisions consistent with the tax status of their investors (i.e., taxable individuals, corporations, retirement plans, etc.). Although capital gains taxes may be an important consideration for certain types of institutional investors, in aggregate, the presence of institutional investors mitigates the effect of capital gains taxes (Ayers, Lefanowicz, and Robinson (2003)). In our research design, the presence of institutional investors should bias against finding a relation between capital gains tax rates and the magnitude of IPO underpricing.

If the marginal seller of IPO shares on the first few days of trading is subject to short-term capital gains taxes on the initial IPO returns, her willingness to sell her initial shares is inversely related to the level of short-term capital gains taxes because these taxes represent a cost of selling her initial shares. To induce her to sell these shares, the buyers in the secondary market have to offer to pay a higher price (lock-in). Alternatively, if initial investors are tax sensitive, underwriters may need to lower the initial offer price to induce these investors to buy the initial allocations (capitalization). If capital gains taxes are capitalized into stock prices, then the tax burden likely is passed onto the equity issuers as underwriters are willing to lower the offer prices so that the initial investors' after-tax returns stay constant. In other words, capital gains taxes represent a component of the cost of equity capital. To summarize, tax capitalization causes IPO initial return to increase through a lower offer price, whereas lock-in causes IPO initial return to increase through a higher secondary market ask price. Thus, our first hypothesis is:

HYPOTHESIS 1: *The magnitude of IPO underpricing increases in the short-term capital gains tax rate.*

Using a group of small IPOs around the 1993 tax law change that reduced the capital gains taxes on qualified small business stocks, Guenther and Willenborg (1999) report that IPOs qualifying for this special preferential tax treatment have higher issuing prices (smaller first-day returns) after the tax regime change, while non-qualifying IPOs are not affected by this tax law change. Their evidence suggests that capital gains taxes affect IPO underpricing. However, their study is restricted to an analysis of a very limited sample of small IPOs (177 IPOs) around 1993 that appeared to qualify for an unusual capital gains treatment. In contrast, we analyze a large sample of IPOs occurring over 18 years. Thus, we are able to provide more general evidence that taxes impact IPO underpricing.

The lock-in effect of capital gains taxes can be distinguished from the capitalization effect by the tension between short-term and long-term capital gains taxes. In the U.S., the long-term capital gains tax rate has been historically lower than the short-term capital gains tax rate. This being the case, initial investors will be less willing to sell IPO shares if the initial gains can qualify for long-term capital gains treatment at a lower rate in the future. For example, suppose that an investor is subject to a long-term capital gains tax rate of 15% and a short-term capital gains tax rate of 35%. In order to realize an after-tax return of 20% on an IPO, this investor must realize a short-term pre-tax return of 30.8% [$20\% / (1 - 0.35)$] but will only need to realize a long-term pre-tax return of 23.5% [$20\% / (1 - 0.15)$]. Hence, the lower the long-term capital gains tax rate, the more likely that initial investors will refrain from selling initial shares. This reduces the supply of initial shares in the secondary market and thereby increases the initial returns.

With the exception of the original owners of the firm, none of the initial investors in an IPO will qualify for a long-term holding period if they sell shares immediately after the IPO. We conjecture that the accumulation of short-term capital gains by initial investors causes the supply of IPO shares to shrink in the secondary market. Because the sale of IPO shares will trigger a tax liability, potential buyers need to offer a higher price to induce initial investors to sell. A reduced long-term capital gains tax rate induces initial investors to delay the sale. To the extent that initial investors ignore this tax saving opportunity and sell shares on the IPO days, initial returns should increase to compensate investors for foregoing the benefits of deferring sales. Thus, our second hypothesis is:

HYPOTHESIS 2: *The magnitude of IPO underpricing decreases in the long-term capital gains tax rate.*

Reese (1998) presents evidence consistent with this conjecture. Using IPO firms, he shows that when the short-term capital gains tax rate is higher than the long-term capital gains tax rate, stocks that have appreciated prior to long-term qualification exhibit increased volume and decreased returns immediately *after* their qualification dates. In contrast, stocks that have declined in value prior to long-term qualification exhibited these same price and volume effects immediately *prior* to the date for long-term qualification.

Reese (1998) does not examine whether capital gains taxes affect stock returns on the first few days of trading after IPOs. There are reasons to believe that the effect of long-term capital gains taxes on the magnitude of IPO underpricing is limited. The incentive of initial investors to wait to sell their shares right after IPOs may not be as pronounced as right before (after) long-term capital gains qualification dates when their shares have appreciated (depreciated). Uncertainty over the long run may mitigate the incentive to

hold shares for long-term qualification. For example, Ritter (1991) and Loughran and Ritter (1995) document that IPO stocks under-perform over time. Hence, the extent to which the lock-in effect is manifested in initial returns is an empirical question.

Hypotheses 1 and 2 suggest that if initial investors value their shares on an after-tax basis, then the magnitude of IPO underpricing increases in short-term capital gains tax rate and decreases in long-term capital gains tax rate. An alternative way of testing Hypotheses 1 and 2 is to examine the link between IPO underpricing and the spread between short-term and long-term capital gains tax rates. The spread between short-term and long-term capital gains tax rates represents the potential tax savings from deferring the realization of the initial gains from IPOs. To the extent that initial investors do not defer the sale of their initial shares, this spread represents a tax burden. In equilibrium, this tax burden may be absorbed by the equity issuers as a component of the cost of equity capital. Thus, we can integrate Hypotheses 1 and 2 into one hypothesis and test whether this spread between long-term and short-term capital gains tax rates is positively associated with the magnitude of IPO underpricing.

HYPOTHESIS 3: *The magnitude of IPO underpricing increases in the spread between short-term and long-term capital gains tax rates.*

Hypothesis 3 is not independent of Hypotheses 1 and 2. It is an alternative way of testing Hypotheses 1 and 2 simultaneously.

Underpricing could reflect capitalization, lock-in, or a combination of these effects, or, if initial investors cannot recoup taxes from either equity issuers or the buyers in the secondary market, then neither effect may occur. Hence, the existence of capitalization and/or lock-in is an empirical question. This study and Dai, Maydew, Shackelford, and

Zhang (2006) are among the first to strive to empirically isolate and estimate these two influences.

III. DATA AND METHODS

We collect an initial sample of 5,534 initial public offerings from 1987 to 2004 using Thomson Financial's SDC Global New Issues Database. We choose to initiate the sample in 1987 for several reasons. First, the Tax Reform Act of 1986 reduced both short-term and long-term capital gains tax rates, and it also significantly altered the tax landscape with major revisions of both corporate and individual taxes. Second, prior to 1987 the short-term and long-term capital gains tax rates were highly correlated, making it difficult to distinguish the capital gains tax capitalization effect from the lock-in effect.⁴ Finally, many of our regression control variables are only available beginning around 1987 (e.g., underwriter rankings, auditors, etc.).

We exclude IPOs that are typically excluded from empirical studies: closed-end funds, REITS, ADRs, unit offerings, IPOs with an offer price below \$5 per share, and financial sector IPOs (one-digit SIC code = 6). We obtain price data from the Center for Research in Security Prices (CRSP) to calculate initial returns. Limiting IPOs to those with initial returns restricts our sample to 4,675 IPOs. To conduct regression analysis, we restrict our sample to those IPOs with complete price and control data. This limitation reduces the regression sample to 4,044 IPOs. The distribution of sample IPOs across

⁴ The correlation between the long-term and short-term capital gains tax rates is primarily due to the deduction for long-term capital gains. In essence, prior to 1986 the long term tax rate was a fraction of the short-term rate, and the fraction was dictated by the percentage of the capital gains deduction. For example, when the capital gains deduction was 60 percent, the long-term tax rate was effectively 40 percent of the short-term rate.

short-term and long-term tax regimes is presented in Table 1, Panels A and B, respectively.

The characteristics of the control variables are presented in Table 2. The firms in our regression sample have an average market capitalization of \$448.9 million, with an average IPO size of \$54.9 million at an average offer price of \$12.19 per share. As the time period spans almost two decades, rather than using the size of the deal in dollars, we use the logarithm of the deal size deflated by the CPI index. The average initial return is 23.65%, with a median of 9.09%, in line with other studies. Most deals are underwritten by high quality underwriters, 47.5% have venture capitalist backing, and 44.4% are in a technology industry. The average (median) firm is just over 13 (4) years old at the time of the IPO.

As controls for underpricing, we include several variables that have been found to be related to initial returns in other studies. Hanley (1993) showed that initial returns are positively correlated with the price revision during the bookbuilding process. This relation is consistent with the model proposed in Benveniste and Spindt (1989) where underwriters induce investors to reveal information during the bookbuilding process by rewarding them with underpricing, as well as with the prospect theory argument in Loughran and Ritter (2002). The result is that there is only a partial adjustment of the offer price to the information revealed during the bookbuilding process.

Underpricing is related to uncertainty about the value of the offering, and thus variables that reduce this uncertainty have been found to be negatively related to underpricing. The reputation of the lead underwriter can certify the quality of the IPO, and thus IPOs underwritten by higher reputation underwriters have less underpricing.

This relation was found during the 1980s (Carter, Dark, and Singh (1998)) but reversed during the 1990s and especially during the dotcom bubble of the late 1990s, where the most prestigious investment banks underwrote enormously underpriced IPOs. Thus, as our sample covers 1987 to 2004, we expect to find the same positive relation between reputation and initial returns as found in Beatty and Welch (1996) and Loughran and Ritter (2004). We use Carter and Manaster's (1990) underwriter ranking, as updated on Jay Ritter's web page. Other variables that are related to the quality of the firm, and hence lower underpricing, are the age of the firm (Field and Karpoff (2002)), a venture-backing dummy (Barry, Muscarella, Peavy, and Vetsuypens (1990)), and auditor prestige (Michaely and Shaw (1995)).

Although the presence of venture capital investors can certify the quality of an IPO to the market and results in lower initial returns, an alternative view is that venture capitalists opportunistically time the IPOs of their investments in order to maximize their returns (Lerner (1994)) and to attract future venture fund investors. Gompers (1996) highlights the motives of young venture capital firms to establish a reputation by successfully exiting their investments quickly through IPOs. This results in higher underpricing for venture-backed IPOs, as the venture capitalists are willing to bear this cost rather than fail to exit the investment. Consistent with this idea, Lee and Wahal (2004) find that venture-backed IPOs have higher initial returns than non-venture-backed IPOs.

During the dotcom boom, IPO initial returns were extremely high, averaging over 70%, so we also add a dummy variable for this time period. Lowry (2003) shows that IPO returns are related to recent past returns and recent IPO activity. We control for hot

IPO cycles by including the average return and the total number of IPOs during a firm's IPO month and the prior month. Underpricing is a cost to the issuing firm. Another cost that the issuing firm bears is the fee paid to the underwriting syndicate. Although fees are clustered at 7% of the offering amount for the majority of offerings (Chen and Ritter (2000)), higher fees are charged for more risky deals.

We control for all the above factors that impact the magnitude of IPO underpricing in our examination of the relation between IPO underpricing and capital gains taxes. We estimate the following regression model:

$$\begin{aligned}
 \text{Underpricing}_{it} = & \beta_0 + \beta_1 \text{ST TAX}_{it} \text{ or } \beta_1 \text{LT TAX}_{it} \text{ or } \beta_1 \text{TAXDIFF}_{it} \\
 & + \beta_2 \text{VC}_{it} + \beta_3 \text{RANK}_{it} + \beta_4 \text{REVISION}_{it} + \beta_5 \text{SPREAD}_{it} \\
 & + \beta_6 \text{TECH}_{it} + \beta_7 \text{VWTOT}_{it} + \beta_8 \text{IPORET}_{it} + \beta_9 \text{IPOTOT}_{it} \\
 & + \beta_{10} \text{AUDITD}_{it} + \beta_{11} \text{LAGE}_{it} + \beta_{12} 1/\text{OFFER}_{it} \\
 & + \beta_{13} \text{PROCEEDS}_{it} + \beta_{14} \text{DOTCOM}_{it} + \varepsilon_{it}, \tag{1}
 \end{aligned}$$

where *Underpricing* is the dependent variable IPO underpricing or first-day return; *ST TAX* is short-term capital gains tax rate; *LT TAX* is long-term capital gains tax rate; and *TAXDIFF* is the spread between short-term capital gains tax rate *ST TAX* and long-term capital gains tax rate *LT TAX*. We test the effects of *ST TAX*, *LT TAX* and *TAXDIFF* separately. We expect the effect of *ST TAX* on *Underpricing* to be positive (Hypothesis 1), the effect of *LT TAX* on *Underpricing* to be negative (Hypothesis 2), and the effect of *TAXDIFF* on *Underpricing* to be positive (Hypothesis 3).

We define our control variables using prior studies. Venture capital backing (*VC*) is represented by a binary dummy that equals one if the IPO has venture capitalists' backing and zero otherwise. Consistent with the view that venture capitalists grandstand via taking their investments public (Gompers (1996); Lee and Wahal (2004)) we expect venture capital backing *VC* to be positively related to *Underpricing*. Reputation of

underwriters (*RANK*) is the Carter-Manaster ranking (Carter and Manaster (1990)). As discussed previously, we expect *RANK* to have a positive effect on *Underpricing* for our time period. We expect price revision (*REVISION*) during the bookbuilding process to be positively related to *Underpricing* (Hanley (1993)). Underwriters do not trade off fees for *Underpricing*, instead charging higher fees for more risky offerings. Hence, we expect the effect of fee paid to underwriters (*SPREAD*) to be positively associated with *Underpricing*. Technology IPOs are represented by a binary variable (*TECH*) that equals one for firms defined as within a technology industry. We define technology industries following the four-digit SIC codes in Cliff and Denis (2004), and we expect *TECH* to have a positive effect on *Underpricing*.

We control for the market return preceding sample IPOs using a market return (*VWTOT*) calculated as the sum of the value weighted market return for the month of the IPO and the month prior to the IPO. We expect *VWTOT* to be positively associated with *Underpricing*. We also control for the strength of the IPO market prior to each IPO by including two variables: the average IPO initial return during a firm's IPO month and the prior month (*IPORET*) and the total number of IPOs during a firm's IPO month and the prior month (*IPOTOT*). We expect *IPORET* to be positively associated with *Underpricing*. If *IPOTOT* represents the total supply of IPOs, it should be negatively associated with *Underpricing*. *AUDITD* is a big-auditor dummy that equals one if the auditor of the IPO firm is a big-8, -6 or -4 auditor, and zero otherwise. We expect *AUDITD* to have a negative effect on *Underpricing*. *LAGE* is the logarithm of a firm's age at IPO. We expect young firms to have more IPO underpricing. $1/OFFER$ is the inverse of IPO offer price. Since firms with a lower offer price have high IPO

underpricing, we expect it to have a positive effect on *Underpricing*. *PROCEEDS* is the logarithm of IPO proceeds in millions, deflated by CPI. We expect it to have a negative effect on *Underpricing*. *DOTCOM* is a dummy variable that equals 1 for an IPO during the dotcom period (January 1999 through March 2000) and zero otherwise. We expect *DOTCOM* to have a positive effect on IPO underpricing.

IV. EMPIRICAL RESULTS ON IPO UNDERPRICING AND CAPITAL GAINS TAXES

Univariate Analysis

Before analyzing the relation between initial returns and capital gains tax rates via regression analysis, we compare the level of initial returns from one tax regime to the next to determine whether the returns appear to move up in higher tax regimes and down in lower tax regimes. Short-term capital gains taxes have the most variation in maximum tax rates with seven different tax regimes. All else equal, we would expect the changes in the mean (median) first-day return to be positively associated with the changes in the short-term regime, but we observe in Panel A of Table 3 that the change in first-day return is in the same direction as the change in the tax rate for only four of the six short-term regime changes.

Likewise, in Panel B of Table 3 the change in first-day return is in the opposite direction as the change in the tax rate for one of the two long-term regime changes. The last column in Table 1 and Table 3 presents the average daily frequency of IPO issuances across each tax regime. All else equal, we would expect IPO volume to change inversely with the top tax rates as high tax rates would inhibit investor demand for shares. However, the pattern of IPOs does not align with the expected tax pattern. Hence, in

Tables 1 and 3 we do not observe a strong pattern of first-day returns or IPO volume consistent with a tax hypothesis. Of course, caution should be used in interpreting descriptive data without other controls.

Regression Analysis

Information for constructing many of our control variables is limited prior to 1980, and hence, our initial regression analysis is based upon IPOs from 1987 through 2004. For example, our measure of underwriter reputation *RANK* is limited to periods beginning in 1980, and our auditor dummy variable *AUDITD* is limited to IPOs occurring after 1986. In addition, from Table 2 it is apparent that many of our sample IPOs fall in one tax regime, the 1993-2000 period that covers the technology bubble period, and this may bias against finding strong time series results that are related to capital gains taxes.

Our regression results are presented in Table 4. In the model with the short-term capital gains tax rate, the coefficient on *ST TAX* is positive (0.72, $t = 4.03$) and significant at the 1% level. This result is consistent with Hypothesis 1: the magnitude of IPO underpricing is positively related to the short-term capital gains tax rate. In the model with the long-term capital gains tax rate, the coefficient on *LT TAX* is negative (-0.63 , $t = -3.35$) and significant at the 1% level. This result is consistent with Hypothesis 2: the magnitude of IPO underpricing is negatively related to long-term capital gains tax rate. While a positive coefficient on *ST TAX* can reflect both a capitalization effect and a lock-in effect, the negative coefficient on *LT TAX* reflects a lock-in effect. When we include *ST TAX* and *LT TAX* simultaneously in the regression model, the coefficient on *ST TAX* is

positive and significant (0.58, $t = 2.98$), and the coefficient on *LT TAX* is negative and significant (-0.40, $t = -1.97$), again supporting both Hypotheses 1 and 2.

In the model using the spread between short-term and long-term capital gains tax rates, the coefficient on *TAXDIFF* is positive (0.50, $t = 4.45$) and significant at the 1% level. This result supports Hypothesis 3. That is, the magnitude of IPO underpricing is positively related to the tax rate difference between short-term and long-term capital gains. In summary, the above results suggest that taxes impact the magnitude of IPO underpricing and that taxes are likely a component of the cost of equity capital.

Based on the regression model that includes short-term and long-term capital gains tax rates simultaneously, the above results suggest that with a 5% increase in the short-term capital gains tax rate, the magnitude of IPO underpricing increases by 2.90% [$0.58 \times 5\%$]; and with a 5% increase in the long-term capital gains tax rate, the magnitude of IPO underpricing decreases by 2.00% [$0.40 \times 5\%$]. Based on the regression model that uses the spread between short-term and long-term capital gains tax rates, a 5% widening of the spread translates into a 2.50% [$0.50 \times 5\%$] increase in the magnitude of IPO underpricing. While it is difficult to predict ex ante the sensitivity of underpricing to capital gains taxes, the economic magnitude of the effect of capital gains taxes based on our regression results appears to be significant.

The effects of most of the control variables are consistent with our expectations. The coefficients on *VC*, *RANK* and *REVISION* are positive and significant in all three models, consistent with the literature. The effect of *SPREAD* is insignificant. The coefficient on *TECH* is positive and significant, suggesting that the magnitude of IPO underpricing is higher for tech firms. While the effect of *VWTOT* is insignificant, there appears to be

some IPO momentum. The coefficient on *IPORET* is positive and significant. The supply of IPOs appears to have a dampening effect on IPO underpricing. The coefficient on *IPO TOT* is negative and significant. The effect of *AUDITD* is negative and marginally significant, suggesting that big auditors help reduce the magnitude of IPO underpricing. The coefficient on *LAGE* is negative and significant, consistent with the literature that younger firms have higher underpricing. $1/OFFER$ appears to be positively related to underpricing, suggesting that higher priced IPOs have lower returns. The effect of *PROCEEDS* is negative and significant, suggesting that size of the IPO negatively impacts underpricing. The effect of *DOTCOM* on underpricing is positive and significant, consistent with our expectation.⁵

Regime Comparisons

So far we have tested the relation between the magnitude of IPO underpricing and the spread between short-term and long-term capital gains tax rates over the period 1987 – 2004 when we have data for control variables. Here we expand our analyses to test the relation between adjacent regimes to determine if the positive relation between IPO underpricing and tax spread holds across changes in short-term capital gains tax rates and long-term capital gains tax rates. In these adjacent regime comparisons, we limit the regression samples to IPOs in two adjacent tax regimes. For example, in comparing the short-term capital gains tax regimes (ST2 and ST3), we limit the regression sample to

⁵ Our results are not driven by the high initial returns in the dotcom period, although the magnitude of coefficients is lower when we exclude this period. Recalculating Table 4 regressions while excluding all 479 IPOs in our sample during the dotcom period of January 1999 through March 2000 result in significant coefficients on the tax variables: *ST TAX* is positive (0.54, $t=4.56$), *LT TAX* is negative (-0.46, $t=-3.62$), *TAXDIFF* is positive (0.37, $t=4.97$), and when we include both *ST TAX* and *LT TAX* the coefficients are both significant (*ST TAX* = 0.44, $t=3.48$, *LT TAX* = -0.28, $t=-2.10$).

IPOs over the period 1988-1990 and 1991-1992. There are sufficient IPO observations to estimate regressions across three short-term capital gains tax regime changes and one long-term capital gains tax regime change, and the regression results are presented in Table 5. We limit our analysis to the model using the spread between short-term and long-term capital gains tax rates, *TAXDIFF*.

For the three short-term capital gains tax regime changes, consistent with Hypothesis 3, the estimated coefficients on *TAXDIFF* are all positive and significant. For example, the estimated coefficient for *TAXDIFF* is 0.49 ($t = 3.38$) when the regression sample is limited to IPOs occurring during the 1991-1992 and 1993-2000 tax regimes. When the regression sample is limited to the two long-term capital gains tax regimes with sufficient sample size (the 1987-1997 and 1997-2003 tax regimes), the estimated coefficient for *TAXDIFF* is also consistent with Hypothesis 3 ($\beta_1 = 0.54$, $t = 4.74$). In summary, the positive relation between the magnitude of IPO underpricing and the spread between short-term and long-term capital gains tax rates is robust when the regression sample is limited to adjacent tax regimes.

Time Clustering

Over time, the number of companies going public fluctuates, resulting in hot and cold IPO markets. This means that our sample is clustered in time with some months having many more observations than other months. Because time periods are not weighted equally in our regressions, our coefficient estimates may be influenced by the hot IPO months. We address this possibility by estimating the regression analysis in Table 4 using each month as our unit of observation, rather than each IPO. We calculate monthly

averages for all variables and estimate the regressions with 196 month-observations. Table 6 shows the results: the monthly average initial return is positively related to the short-term tax rate, negatively (but insignificantly) related to the long-term capital gains tax rate, and positively related to the spread between them. We conclude that time clustering is unlikely to be responsible for our results.

Individual and Institutional Investors

The relation between personal tax rates and underpricing should be stronger in IPOs with more individual investors. However, institutional investors constitute a segment of IPO investors, and institutions may be nontaxable entities. Unfortunately, we cannot ascertain which IPOs are more likely to be sensitive to tax rates because IPO allocations are not made public. While we do not have a good measure of the number of shares allocated to and purchased by institutions in any specific IPO, we can collect *ex post* institutional ownership from Spectrum SEC 13F reports. These quarterly reports contain institutional ownership and provide an approximate measure of institutional participation in IPOs, albeit up to three months after the initial trading date.

We collect the first reported institutional ownership from the Spectrum database for 3,949 of the 4,044 IPO firms. We include the percent of shares owned by institutions as an additional control variable in our return regressions. To test whether the relation between taxes and initial returns is stronger for firms with more individual initial investors, we interact institutional ownership percentage with our tax variables. We expect a negative coefficient on the interaction with short-term tax rate and positive coefficient on the interaction with long-term tax rate. None of the interaction variables is

significant (results not tabulated), and thus we are unable to verify that the impact of taxes is stronger in IPOs with more individual investors.

We test several other proxies for institutional/individual ownership. For example, we posit that small IPOs and IPOs underwritten by low reputation underwriters (Carter-Manaster rank less than eight) are likely to have fewer shares allocated to institutions, and thus, the underpricing of these IPOs may be more strongly related to individual tax rates. Using interactions with these proxies in our regressions, we are again unable to report any significant tax coefficients (results not tabulated). Hence, while our results are consistent with individual tax capitalization and lock-in for IPOs, we are unable to directly verify whether firms with higher individual ownership are more likely to exhibit capitalization or lock-in effects.

V. EMPIRICAL RESULTS ON IPO FIRST-DAY TRADING VOLUME AND CAPITAL GAINS TAXES

As the capital gains tax lock-in hypothesis has implications for the willingness of initial investors to sell, we expect that IPO first-day trading volume will be related to taxes. Specifically, the lock-in effect should make an initial investor more reluctant to sell IPO shares. Thus, we expect a negative (positive) relation between short-term (long-term) capital gains tax rates and first-day trading volume. However, there are several reasons why it may be difficult to empirically detect any direct relation between tax rates and trading volume. First, the trading volume for IPOs is extraordinarily high on the first days of trading (Aggarwal (2000); Ellis, Michaely, and O'Hara (2000)). Moreover, first-day trading volume is related to the initial return (i.e. IPOs with larger underpricing have higher trading volume). Finally, over our sample time period, trading volume has

increased across all stocks, and thus we have a general trend of larger trading volume in the later part of our sample period.⁶

Rather than testing the direct relation between volume and taxes, we examine how taxes interact with the relation between trading volume and underpricing. Because there is a strong positive relation between trading volume and underpricing, we posit that this relation will be moderated in periods with high lock-in effect (e.g., high short-term tax rate or low long-term tax rate). Specifically, if short-term capital gains taxes suppress selling on the first day, we would expect the short-term capital gains tax rate to dampen the relation between trading volume and underpricing. On the other hand, if a higher long-term capital gains tax rate makes initial investors less willing to delay their sale of initial shares, it should enhance the relation between trading volume and underpricing. Combining both of these predictions, the relation between trading volume and underpricing should decrease in the spread between short-term and long-term capital gains tax rates. We estimate the following regression model:

$$\begin{aligned}
 IPO\ TURNOVER_{it} = & \alpha_0 + \alpha_1 TAX_{it} + \alpha_2 Underpricing_{it} + \alpha_3 TAX \cdot Underpricing_{it} \\
 & + \alpha_4 VC_{it} + \alpha_5 RANK_{it} + \alpha_6 REVISION_{it} + \alpha_7 SPREAD_{it} \\
 & + \alpha_8 TECH_{it} + \alpha_9 VWTOT_{it} + \alpha_{10} IPORET_{it} + \alpha_{11} IPOTOT_{it} \\
 & + \alpha_{12} AUDITD_{it} + \alpha_{13} LAGE_{it} + \alpha_{14} 1/OFFER_{it} \\
 & + \alpha_{15} PROCEEDS_{it} + \alpha_{16} DOTCOM_{it} + \varepsilon_{it}.
 \end{aligned} \tag{2}$$

The dependent variable, *IPO TURNOVER*, is defined as the number of shares traded on the first day of trading scaled by the number of shares offered in the IPO. We estimate four regressions, each with a different *TAX* measure: either the short term capital gains tax rate (*ST TAX*), the long term capital gains tax rate (*LT TAX*), both short-term and

⁶ For example, the average daily trading volume on the NYSE was 157,000,000 shares per day in 1990, 346,000,000 shares per day in 1995, 1,042,000,000 shares per day in 2000 (source: NYSE Statistics Archive at www.nyse.com)

long-term capital gains tax rates, or the spread between the short-term and long-term capital gains tax rates (*TAXDIFF*). In each regression, the variable of interest is the interaction term between *TAX* and *Underpricing*. To avoid multicollinearity, the mean of each interacted variable is subtracted first, and the interaction is calculated as the product of the de-measured underpricing and tax variables. We include the same control variables as in the prior regressions in Tables 4 and 5.

Table 7 presents regression results analyzing the effect of capital gains taxes on IPO first-day trading volume. The average IPO turnover is 80% of the offering, with a median of 64%, in line with other studies. The estimated coefficients on the tax variables reflect the increase in volume over time (higher volume in the 1990s when short term tax rates were higher and long-term tax rates were lower), and the positive coefficient on underpricing is as expected.

Our focus is on the interaction terms, and we find coefficients consistent with the capital gains tax lock-in effect dampening trading volume: A higher short-term capital gains tax rate results in a decrease in the relation between trading volume and underpricing (coeff. = -0.04, $t = -3.32$); a higher long-term capital gains tax rate results in an increase in the relation between trading volume and underpricing (coeff. = 0.07, $t = 11.37$); and the wider the spread between the short-term and long-term capital gains tax rates, the smaller the magnitude of the relation between trading volume and underpricing (coeff. = -0.04, $t = -9.74$). This volume-based result is important because it suggests that the lock-in effect works through reducing the supply and thus the trading of initial shares in the secondary market.

VI. CONCLUSIONS

In this paper, we empirically examine whether the magnitude of IPO underpricing is related to capital gains taxes. We argue that if the initial investors of an IPO evaluate returns on an after-tax basis, then underwriters should consider investor tax rates when setting offer prices to provide adequate after-tax returns. Alternatively, initial investors could set ask prices that have the effect of shifting the tax burden to secondary market investors. Thus, when initial investors are the marginal sellers on the first day of an IPO, the magnitude of IPO underpricing should increase in short-term capital gains tax rate. The long-term capital gains tax rate is historically lower than the short-term capital gains tax rate. It represents the benefit of delaying the realization of initial returns. The lower the long-term capital gains tax rate, the more reluctant initial investors are to sell their shares right after IPOs to realize the short-term capital gains. To induce them to sell, initial before-tax returns have to be higher. Thus, the magnitude of IPO underpricing should decrease in long-term capital gains tax rate.

Using a large sample of IPOs spanning the period 1987 – 2004, we find a positive relation between the magnitude of IPO underpricing and the short-term capital gains tax rate and a negative relation between the magnitude of IPO underpricing and the long-term capital gains tax rate. We also find a positive relation between IPO underpricing and the spread between short-term and long-term capital gains tax rates. Further, our analysis of first-day trading volume suggests that short-term capital gains taxes suppress IPO trading volume, while long-term capital gains taxes enhance IPO trading volume, due to the lock-in effect. These results reinforce the notion that taxes are a factor, among others,

that determines the magnitude of IPO underpricing. More broadly, our results suggest that taxes influence asset prices through both the capitalization and lock-in effects.

REFERENCES

- Aggarwal, R., 2000, Stabilization activities by underwriters after Initial Public Offerings, *Journal of Finance* 50, 1075-1103.
- Allen, F., and Faulhaber, G., 1989, Signaling by underpricing in the IPO market, *Journal of Financial Economics* 23, 303-323.
- Ayers, B.C., C.B. Cloyd, and J.R. Robinson, 2002, Capitalization of shareholder taxes in stock prices: Evidence from the Revenue Reconciliation Act of 1993, *The Accounting Review* 77, 933-947.
- Ayers, B.C., C. E. Lefanowicz, and J. R. Robinson, 2003, Shareholder taxes in acquisition premiums: The effect of capital gains taxation, *The Journal of Finance* 58, 2783-2801.
- Barry, C., Muscarella, C., Peavy, J., and Vetsuypens, M., 1990, The role of venture capital in the creation of public companies: evidence from the going-public process, *Journal of Financial Economics* 27, 447-471.
- Beatty, R., and Welch, I., 1996, Issuer expenses and legal liability in initial public offerings, *Journal of Law and Economics* 39, 545-602.
- Benveniste, L., and Spindt, P., 1989, How investment bankers determine the offer price and allocation of new issues, *Journal of Financial Economics* 24, 343-362.
- Blouin, J.L., Raedy, J.S., Shackelford, D.A., 2003. Capital gains taxes and equity trading: Empirical evidence. *Journal of Accounting Research* 41, 611-651.
- Boehmer, B., Boehmer, E., and Fische, R., 2006, Do institutions receive more favorable allocations in IPOs with better long run market performance? *Journal of Financial and Quantitative Analysis*, forthcoming.
- Brav, A., and Gompers, P., 2003, The role of lockups in initial public offerings, *Review of Financial Studies* 16, 1-29.
- Brennan, M., J., 1970, Taxes, market valuation and corporate financial policy. *National Tax Journal* 23, 417-427.
- Carter, R., Dark, F., and Singh, A., 1998, Underwriter reputation, initial returns, and the long-run performance of IPO stocks, *Journal of Finance* 53, 285-311.
- Carter, R., Manaster, S., 1990. Initial public offerings and underwriter reputation. *Journal of Finance* 44, 1045-1067.

- Chen, H., and Ritter, J., 2000, The seven percent solution, *Journal of Finance* 55, 1105-1131.
- Cliff, M. T., and D. J. Denis, 2004, Do initial public offering firms purchase analyst coverage with underpricing? *Journal of Finance*, 59, 2871-2901.
- Dai, Z., E. Maydew, D. A. Shackelford, and H. H. Zhang, 2006, Capital gains taxes and asset prices: Capitalization or lock-in, *working paper*.
- Dhaliwal, D. S., Li, O. Z., R. Trezevant, 2003, Is a dividend tax penalty incorporated into common stock returns? *Journal of Accounting and Economics*, 35, 155-178.
- Dhaliwal, D. S., Krull, L., Li, O. Z., Moser, W., 2005. Dividend taxes and implied cost of equity capital. *Journal of Accounting Research* 43, 675-708.
- Dhaliwal, D. S., Li, O. Z., 2006, Investor tax heterogeneity and ex-dividend day trading volume. *Journal of Finance* 61, 463-490.
- Ellis, K., Michaely, R., and O'Hara, M., 2000, When the underwriter is the market maker: an examination of trading in the IPO aftermarket, *Journal of Finance* 55, 1039-1074.
- Erickson, M., and E. Maydew, 1998, Implicit taxes in high dividend yield stocks, *Accounting Review* 73, 435-458.
- Field, L., and Hanka, G., 2001, The expiration of IPO share lockups, *Journal of Finance* 56, 471-500.
- Field, L., and Karpoff, J., 2002, Takeover Defenses of IPO Firms, *Journal of Finance* 57, 1857-1889.
- Gompers, P., 1996, Grandstanding in the venture capital industry, *Journal of Financial Economics* 42, 133-156.
- Guenther, D.A., Willenborg, M., 1999. Capital gains tax rates and the cost of capital for small business: Evidence from the IPO market. *Journal of Financial Economics* 53, 385-408.
- Hanley, K., 1993, Underpricing of initial public offerings and the partial adjustment phenomenon, *Journal of Financial Economics* 34, 231-250.
- Hanley, K., and Wilhelm, W., 1995, Evidence on the strategic allocation of initial public offerings, *Journal of Financial Economics* 37, 239-257.
- Helwege, J., and Liang, N., 2004, Initial public offerings in hot and cold markets, *Journal of Financial and Quantitative Analysis* 39, 541-569.

- Ibbotson, R., and Jaffe, J., 1975, Hot Issue Markets, *Journal of Finance* 30, 1027-1042.
- Ivkovic, Z., J. Poterba, and S. Weisbenner, 2004, Tax-motivated trading by individual investors, *working paper*.
- Klein, P., 1999, The capital gain lock-in effect and equilibrium returns, *Journal of Public Economics* 71, 355-378.
- Klein, P., 2001, The capital gain lock-in effect and long-horizon return reversal, *Journal of Financial Economics* 59, 33-62.
- Landsman, W. R., and D. A. Shackelford, 1995, The lock-in effect of capital gains taxes: Evidence from the RJR Nabisco leveraged buyout, *National Tax Journal* 48, 245-259.
- Lang, M., and D. A. Shackelford, 2000, Capitalization of capital gains taxes: Evidence from stock price reactions to the 1997 rate reductions, *Journal of Public Economics* 76: 69-85.
- Lee, P., and Wahal, S., 2004, Grandstanding, certification and the underpricing of venture capital backed IPOs, *Journal of Financial Economics* 73, 375-407.
- Lerner, J., 1994, Venture capitalists and the decision to go public, *Journal of Financial Economics* 35, 293-316.
- Ljungqvist, A., 2006, IPO underpricing, in B. Espen Eckbo (ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*, Handbooks in Finance Series, Elsevier/North-Holland, forthcoming.
- Ljungqvist, A., Nanda, V., and Singh, R., 2006, Hot markets, investor sentiment, and IPO pricing, *Journal of Business*, forthcoming.
- Loughran T, Ritter, J.R., 1995. The new issues puzzle. *Journal of Finance* 50, 23-51.
- Loughran T, Ritter, J.R., 2002, Why don't issuers get upset about leaving money on the table in IPOs? *Review of Financial Studies* 15, 413-443.
- Loughran T, Ritter, J.R., 2004, Why has IPO underpricing increased over time? *Financial Management* 33, 5-37.
- Lowry, M., 2003, Why does IPO volume fluctuate so much? *Journal of Financial Economics* 67, 3-40.
- Michaely, R., and Shaw, W., 1995, Does the choice of auditor convey quality in an initial public offering? *Financial Management* 24, 15-30.

- Poterba J. and S. Weisbenner, 2001, Capital gains tax rules, tax-loss trading and turn-of-the-year returns, *Journal of Finance* 56: 353-368.
- Reese, W., 1998. Capital gains taxation and stock market activity: Evidence from IPOs, *Journal of Finance* 53, 1799-1820.
- Ritter, J., 1991. The long-run performance of initial public offerings. *Journal of Finance* 45, 3-27.
- Rock, K., 1986, Why new issues are underpriced, *Journal of Financial Economics* 15, 187-212.
- Tinic, S., 1988, Anatomy of initial public offerings of common stock, *Journal of Finance* 43, 789-822.
- Viard, A. D., 2000. Dynamic asset pricing effects and incidence of realization-based capital gains taxes, *Journal of Monetary Economics* 46, 465-488.

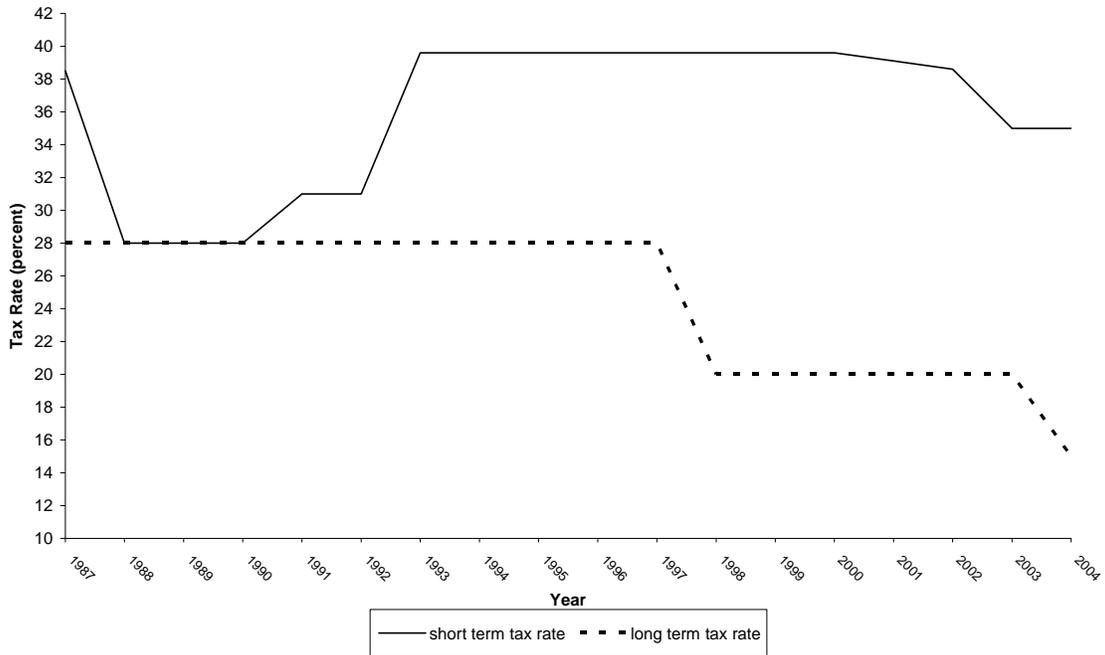


Figure 1. Short-term and long-term capital gains tax rates 1987-2004. The short-term tax rates are the marginal tax rates faced by individuals in the highest income bracket and the long-term tax rates are the rates that apply after the stock has been held for one year. Tax regimes changes occur on the effective dates of the legislation with one exception. The Tax Reform Act of 1997 decreased the maximum long-term capital gains tax rate from 28 to 20 percent effective May 7, 1997. The change in tax rates in 2003 occurred on May 5, 2003 but was retroactive to the beginning of the year. All other tax rate changes occur at year end.

TABLE 1
Distribution of Sample IPOs and Underpricing Statistics Across Tax Regimes

Panel A: Frequency of sample IPOs across short-term capital gains tax rates					
Tax Regime	Maximum tax rate	Number of sample IPOs	Percentage of sample IPOs	Average IPOs per Day	Change in Daily Frequency
1987	38.5%	207	5.12	0.83	
1988-1990	28%	253	6.26	0.34	Down
1991-1992	31%	511	12.64	1.02	Up
1993-2000	39.6%	2,925	72.33	1.46	Up
2001	39.1%	53	1.31	0.21	Down
2002	38.6%	48	1.19	0.19	Down
2003-2004	35%	47	1.16	0.09	Down

Panel B: Frequency of sample IPOs across long-term capital gains tax rates					
Tax Regime	Maximum tax rate	Number of sample IPOs	Percentage of sample IPOs	Average IPOs per Day	Change in Daily Frequency
1987-1997	28%	2,724	67.36	0.99	
1997-2003	20%	1,273	31.48	0.73	Down
2003-2004	15%	47	1.16	0.09	Down

The sample consists of IPOs from 1987 through 2004 identified by Thompson Financial Securities Data Corporation with stock price data on CRSP and complete regression information. IPOs from closed-end funds, REITS, ADRs, unit offerings, IPOs with an offer price below \$5 per share, and financial sector IPOs were eliminated from the sample. Sample IPOs are classified according to the tax rate effective on the issuance date. Tax regimes changes occur on the effective dates of the legislation with one exception. The Tax Reform Act of 1997 decreased the maximum long-term capital gains tax rate from 28 to 20 percent effective May 7, 1997. The change in tax rates in 2003 occurred on May 5, 2003 but was retroactive to the beginning of the year. All other tax rate changes occur at year end. The short-term capital gains tax rate is the marginal tax rate faced by individuals in the highest income bracket, and the long-term capital gains tax rate is the tax rate applicable after stock has been held for more than one year. IPO underpricing (initial return) is the change in price from the offering price to the closing price on the first day of trading.

TABLE 2
Sample Statistics for the Regression Sample 1987-2004 (N=4,044)

Panel A: Descriptive Statistics					
Variable	Mean	Std Dev.	25%	Median	75%
Market Capitalization (\$ in millions)	448.91	2,697.56	129.91	58.50	330.75
Total Assets (\$ in millions)	208.95	1,355.68	59.13	28.31	133.67
Offering Price	12.19	5.01	12.00	8.50	15.00
Shares Offered (millions)	3.38	5.03	2.40	1.50	3.82
Percentage of Firm Sold	38.61	348.82	25.00	16.67	34.10
Initial Return (percent)	23.65	48.79	9.09	0.52	25.98
Carter Manaster Rank	7.23	2.20	8.00	6.25	9.00
Price Revision from Filing to Offer (percent)	2.12	22.63	0.00	-9.09	9.68
Average IPO Initial Return during month of IPO and prior month (percent)	23.84	22.02	15.72	12.13	21.40
Total Number of IPOs during month of IPO and prior month	96.82	38.25	97.00	72.00	117.00
Age of Firm in Years	13.30	18.38	7.00	4.00	14.00
Offering Proceeds (\$ in millions)	54.89	100.13	32.50	17.10	58.40

Panel B: Frequency distribution over tax regimes			
	Sample Size	Technology	Venture
Overall sample	4,044	44.36%	47.53%
<u>Short-term Regimes</u>			
1987	207	29.95%	38.16%
1988-1990	253	31.62%	43.08%
1991-1992	511	37.77%	50.49%
1993-2000	2,925	47.69%	48.00%
2001	53	39.62%	54.72%
2002	48	43.75%	43.75%
2003-2004	47	46.81%	46.81%
<u>Long-term Regimes</u>			
1987-1997	2,724	38.73%	44.35%
1997-2003	1,273	56.32%	54.36%
2003-2004	47	46.81%	46.81%

The market capitalization is the value of all stock outstanding on the offer date, using CRSP shares outstanding and the closing price on the first day of trading. The percentage of the firm offered is calculated as the number of shares offered in the IPO divided by the total shares outstanding after the IPO. The initial return is the difference between the first trading day closing price reported by CRSP and the offer price, deflated by the offer price. Technology firms are defined using the four-digit SIC codes in Cliff and Denis (2004). Venture is a binary variable that equals one where Thompson Financial recorded the IPO as backed by venture capital. The lead underwriter reputation is measured by the Carter Manaster (1990) rank, as updated on Jay Ritter's website. The price revision from filing to offer is measured from the midpoint of the filing range to the offer price. Data on firm age, number of IPOs and average initial return are collected from Jay Ritter's website.

TABLE 3
Distribution of IPO Underpricing Across Tax Regimes

Panel A: Mean and median underpricing (initial return) across short-term capital gains tax regimes							
Tax Regime	Tax Rate	Sample Size	Mean Initial Return	Median Initial Return	Tax Rate Change	Median Reaction Change	Change in Daily Frequency
1987	38.5%	207	7.09%	1.92%			
1988-1990	28%	253	8.53%	4.17%	Down	Up*	Down
1991-1992	31%	511	11.48%	5.88%	Up	Up	Up
1993-2000	39.6%	2,925	28.81%	11.36%	Up	Up*	Up
2001	39.1%	53	15.40%	13.00%	Down	Up	Down
2002	38.6%	48	10.27%	8.45%	Down	Down*	Down
2003-2004	35%	47	12.03%	8.33%	Down	Down	Down

Panel B: Mean and median underpricing (initial return) across long-term capital gains tax regimes							
Tax Regime	Tax Rate	Sample Size	Mean Initial Return	Median Initial Return	Tax Rate Change	Median Reaction Change	Change in Daily Frequency
1987-1997	28%	2,724	13.44%	6.52%			
1997-2003	20%	1,273	45.94%	18.75%	Down	Up*	Down
2003-2004	15%	47	12.03%	8.33%	Down	Down*	Down

The initial return (*Underpricing*) is the difference between the first trading day closing price reported by CRSP and the initial offer price deflated by the offer price.

* Change in median price reactions between adjacent tax regimes is significant (Median test $p < 0.05$).

TABLE 4
Initial IPO Underpricing Regression Results 1987-2004 (N=4,044)

Variables	Coefficient Estimates (t statistics)			
<i>Intercept</i>	-45.61 (-3.89)***	-4.68 (-0.43)	-30.74 (-2.21)**	-25.54 (-2.57)***
<i>ST TAX (+)</i>	0.72 (4.03)***	-	0.58 (2.98)***	-
<i>LT TAX (-)</i>	-	-0.63 (-3.35)***	-0.40 (-1.97)**	-
<i>TAXDIFF (+)</i>	-	-	-	0.50 (4.45)***
<i>VC</i>	2.94 (2.22)**	2.89 (-2.19)**	2.98 (2.25)**	2.98 (2.25)**
<i>RANK</i>	2.49 (5.70)***	2.32 (5.35)***	2.48 (5.69)***	2.46 (5.66)***
<i>REVISION</i>	1.07 (32.89)***	1.07 (32.85)***	1.07 (32.95)***	1.08 (33.00)***
<i>SPREAD</i>	1.06 (1.00)	0.98 (0.92)	0.95 (0.89)	0.93 (0.88)
<i>TECH</i>	3.07 (2.40)**	3.02 (2.35)**	2.88 (2.25)**	2.87 (2.24)**
<i>VWTOT</i>	-0.06 (-0.52)	-0.09 (-0.79)	-0.07 (-0.57)	-0.07 (-0.60)
<i>IPORET</i>	0.50 (9.24)***	0.51 (9.40)***	0.48 (8.90)***	0.48 (8.90)***
<i>IPOTOT</i>	-0.05 (-2.98)***	-0.004 (-0.28)	-0.04 (-1.88)*	-0.03 (-1.93)*
<i>AUDITD</i>	-5.13 (-1.67)*	-4.75 (-1.54)	-4.97 (-1.62)	-4.92 (-1.60)
<i>LAGE</i>	-1.52 (-2.45)**	-1.64 (-2.65)***	-1.50 (-2.43)**	-1.52 (-2.45)**
<i>1/OFFER</i>	81.26 (2.89)***	75.67 (2.69)***	79.78 (2.83)***	79.11 (2.81)***
<i>PROCEEDS</i>	-2.31 (-2.00)**	-2.56 (-2.19)**	-2.73 (-2.33)**	-2.78 (-2.38)**
<i>DOTCOM</i>	10.64 (3.11)***	8.31 (2.41)**	9.56 (2.76)***	9.25 (2.71)***
Adjusted R ²	0.455	0.454	0.455	0.455

The initial return (*Underpricing*) is the difference between the first trading day closing price reported by CRSP and the initial offer price deflated by the offer price. Reputation of underwriters (*RANK*) using the updated Carter-Manaster ranking (Carter and Manaster, 1990) available on Jay Ritter's website. Pricing revision (*REVISION*) is the percentage price revision from midpoint of initial filing range to the offer price. Underwriters fees (*SPREAD*) is the total underwriting/management/selling fees as a percentage of the amount offered in the IPO. The market return preceding sample IPOs (*VWTOT*) is the sum of the value weighted market return for the month of the IPO and the month prior to the IPO. The average IPO initial return during a firm's IPO month and the prior month is *IPORET* and the total number of IPOs during a firm's IPO month and the prior month is *IPOTOT*. *AUDITD* is a big-auditor dummy that equals to one if the auditor of the IPO firm is a big-8, 6 or 4 auditor. *1/OFFER* is the inverse of IPO offer price. *PROCEEDS* is the logarithm of IPO proceeds in millions, divided by CPI. *TECH* dummy is an indicator variable for technology firms that equals one for technology firms defined using the four-digit SIC codes in Cliff and Denis (2004). *VC* dummy is an indicator variable for venture capital backing that equals one where Thompson Financial recorded the IPO as backed by venture capital. *DOTCOM* dummy is an indicator variable that equals one for the time period January 1999 to March 2000.

The numbers in parentheses are t-statistics, and all tests are two-tail tests. ***, ** and * represent significance levels at 1%, 5% and 10%, respectively.

TABLE 5
Underpricing Regression Results Combining Adjacent Tax Regimes

Variables	Coefficient Estimates (t statistics)			
	<u>Short-term Tax Regimes</u>			<u>Long-term</u>
	1988-1990 & 1991-1992	1991-1992 & 1993-2000	1993-2000 & 2001	1987-1997 & 1997-2003
<i>Intercept</i>	-5.99 (-0.55)	-24.02 (-2.06)**	-27.53 (-2.07)**	-24.97 (-2.49)**
TAXDIFF (+)	1.07 (1.76)*	0.49 (3.38)***	0.55 (2.20)**	0.54 (4.74)***
<i>VC</i>	2.31 (1.84)*	3.16 (2.07)**	3.04 (1.77)*	3.06 (2.29)**
<i>RANK</i>	0.29 (7.91)***	1.14 (31.17)***	1.21 (29.95)***	2.45 (5.58)***
<i>REVISION</i>	-0.36 (-0.78)	2.85 (5.68)***	3.29 (5.85)***	1.08 (32.90)***
<i>SPREAD</i>	3.12 (2.93)***	0.62 (0.51)	0.13 (0.09)	0.98 (0.92)
<i>TECH</i>	2.18 (1.78)*	3.35 (2.28)**	3.47 (2.10)**	2.93 (2.27)**
<i>VWTOT</i>	-0.04 (-0.26)	-0.12 (-0.81)	-0.10 (-0.62)	-0.05 (-0.40)
<i>IPORET</i>	0.42 (4.09)***	0.46 (7.52)***	0.45 (7.00)***	0.47 (8.53)***
<i>IPOPOT</i>	-0.02 (-0.74)	-0.05 (-2.45)**	-0.05 (-2.22)**	-0.04 (-2.38)**
<i>AUDITD</i>	-0.24 (-0.10)	-5.86 (-1.62)	-5.94 (-1.44)	-4.95 (-1.60)
<i>LAGE</i>	-1.67 (-2.58)***	-1.73 (-2.41)**	-1.91 (-2.36)**	-1.51 (-2.42)**
<i>1/OFFER</i>	-50.23 (-2.10)**	91.70 (2.77)***	114.02 (3.01)***	79.15 (2.79)***
<i>PROCEEDS</i>	0.79 (0.74)	-3.51 (-2.52)**	-4.45 (-2.82)***	-2.64 (-2.23)**
<i>DOTCOM</i>	-	8.66 (2.34)**	7.25 (1.82)*	9.21 (2.68)***
N	764	3,436	2,978	3,997
Adjusted R ²	0.213	0.458	0.464	0.456

The initial return (*Underpricing*) is the difference between the first trading day closing price reported by CRSP and the initial offer price deflated by the offer price. Reputation of underwriters (*RANK*) using the Carter-Manaster ranking (Carter and Manaster, 1990). Pricing revision (*REVISION*) is the percentage price revision from midpoint of initial filing range to the offer price. Underwriters fees (*SPREAD*) is the total underwriting/management/selling fees as a percentage of the amount offered in the IPO. The market return preceding sample IPOs (*VWTOT*) is the sum of the value weighted market return for the month of the IPO and the month prior to the IPO. The average IPO initial return during a firm's IPO month and the prior month is *IPORET* and the total number of IPOs during a firm's IPO month and the prior month is *IPOPOT*. *AUDITD* is a big-auditor dummy that equals to one if the auditor of the IPO firm is a big-8, 6 or 4 auditor. *1/OFFER* is the inverse of IPO offer price. *PROCEEDS* is the logarithm of IPO proceeds in millions, divided by CPI. *TECH* dummy is an indicator variable for technology firms that equals one for technology firms defined using the four-digit SIC codes in Cliff and Denis (2004). *VC* dummy is an indicator variable for venture capital backing that equals one where Thompson Financial recorded the IPO as backed by venture capital. *DOTCOM* dummy is an indicator variable that equals one for the time period January 1999 to March 2000.

The numbers in parentheses are t-statistics, and all tests are two-tail tests. ***, ** and * represent significance levels at 1%, 5% and 10%, respectively.

TABLE 6
Monthly Underpricing Regression Results 1987-2004 (N=196)

Variables	Coefficient Estimates (t statistics)			
<i>Intercept</i>	13.79 (0.26)	71.97 (1.38)	23.24 (0.40)	42.59 (0.83)
<i>ST TAX</i> (+)	0.74 (2.38)**	-	0.67 (1.92)*	-
<i>LT TAX</i> (-)	-	-0.55 (-1.46)	-0.19 (-0.46)	-
<i>TAXDIFF</i> (+)	-	-	-	0.46 (2.31)**
<i>VC</i>	7.56 (1.07)	8.11 (1.13)	7.42 (1.04)	7.43 (1.05)
<i>RANK</i>	-1.86 (-0.89)	-3.12 (-1.54)	-1.92 (-0.91)	-2.22 (-1.08)
<i>REVISION</i>	-0.23 (-1.45)	-0.28 (-1.72)*	-0.23 (-1.41)	-0.23 (-1.44)
<i>SPREAD</i>	5.54 (1.03)	4.28 (0.78)	5.12 (0.94)	4.52 (0.84)
<i>TECH</i>	1.81 (0.29)	2.05 (0.32)	1.37 (0.22)	1.08 (0.17)
<i>VWTOT</i>	0.19 (1.04)	0.12 (0.65)	0.18 (1.02)	0.17 (0.93)
<i>IPORET</i>	1.08 (8.03)***	1.12 (8.34)***	1.08 (8.01)***	1.09 (8.10)***
<i>IPOTOT</i>	-0.13 (-3.80)***	-0.08 (-2.56)**	-0.12 (-3.21)***	-0.11 (-3.40)***
<i>AUDITD</i>	-15.40 (-0.89)	-14.13 (-0.81)	-15.25 (-0.88)	-14.88 (-0.86)
<i>LAGE</i>	-9.53 (-2.82)***	-10.49 (-3.10)***	-9.60 (-2.84)***	-9.85 (-2.93)***
<i>1/OFFER</i>	-362.96 (-2.74)***	-390.27 (-2.93)***	-359.02 (-2.70)***	-361.33 (-2.72)***
<i>PROCEEDS</i>	-5.25 (-1.31)	-5.43 (-1.29)	-5.80 (-1.39)	-6.28 (-1.52)
<i>DOTCOM</i>	2.21 (0.29)	-0.20 (-0.03)	1.72 (0.22)	0.85 (0.11)
Adjusted R ²	0.7259	0.7206	0.72	0.7254

Instead of using each IPO as an independent observation we use each month, resulting in 196 months from 1987 to 2004 with at least one IPO with available data. Using all IPOs during a given month, the equally-weighted averages are calculated for *Underpricing*, *RANK*, *REVISION*, *SPREAD*, *AUDITD*, *1/OFFER*, *PROCEEDS*, *TECH*, *VC*. The initial return (*Underpricing*) is the difference between the first trading day closing price reported by CRSP and the initial offer price deflated by the offer price. Reputation of underwriters (*RANK*) using the Carter-Manaster ranking (Carter and Manaster, 1990). Pricing revision (*REVISION*) is the percentage price revision from midpoint of initial filing range to the offer price. Underwriters fees (*SPREAD*) is the total underwriting/management/selling fees as a percentage of the amount offered in the IPO. The market return preceding sample IPOs (*VWTOT*) is the sum of the value weighted market return for the month of the IPO and the month prior to the IPO. The average IPO initial return during a firm's IPO month and the prior month is *IPORET* and the total number of IPOs during a firm's IPO month and the prior month is *IPOTOT*. *AUDITD* is a big-auditor dummy that equals to one if the auditor of the IPO firm is a big-8, 6 or 4 auditor. *1/OFFER* is the inverse of IPO offer price. *PROCEEDS* is the logarithm of IPO proceeds in millions, divided by CPI. *TECH* dummy is an indicator variable for technology firms that equals one for technology firms defined using the four-digit SIC codes in Cliff and Denis (2004). *VC* dummy is an indicator variable for venture capital backing that equals one where Thompson Financial recorded the IPO as backed by venture capital. *DOTCOM* dummy is an indicator variable that equals one for the time period January 1999 to March 2000.

The numbers in parentheses are t-statistics, and all tests are two-tail tests. ***, ** and * represent significance levels at 1%, 5% and 10%, respectively.

TABLE 7
First-Day Trading Volume Regression Results 1987-2004 (N=4,044)

Variables	Coefficient Estimates (t statistics)			
<i>Intercept</i>	-28.08 (-1.74)*	57.54 (4.13)***	22.89 (1.22)	-0.05 (0.00)
<i>ST TAX</i>	1.19 (4.39)***	-	0.78 (2.76)***	-
<i>LT TAX</i>	-	-2.02 (-8.19)***	-1.74 (-6.59)***	-
<i>TAXDIFF</i>	-	-	-	1.03 (6.79)***
<i>Underpricing</i>	0.51 (17.48)***	0.71 (22.89)***	0.69 (20.68)***	0.70 (20.81)***
<i>ST TAX·Underpricing (-)</i>	-0.04 (-3.32)***	-	0.01 (0.70)	-
<i>LT TAX·Underpricing (+)</i>	-	0.07 (11.37)***	0.07 (10.68)***	-
<i>TAXDIFF·Underpricing (-)</i>	-	-	-	-0.04 (-9.74)***
<i>VC</i>	8.62 (5.00)***	8.87 (5.25)***	9.01 (5.34)***	8.83 (5.21)***
<i>RANK</i>	5.61 (9.83)***	5.53 (9.97)***	5.71 (10.22)***	5.93 (10.59)***
<i>REVISION</i>	0.17 (3.62)***	0.18 (3.86)***	0.19 (3.99)***	0.19 (3.95)***
<i>SPREAD</i>	4.55 (3.29)***	3.12 (2.30)**	3.14 (2.31)**	3.29 (2.42)**
<i>TECH</i>	12.84 (7.69)***	10.63 (6.48)***	10.51 (6.40)***	10.95 (6.65)***
<i>VWTOT</i>	-0.21 (-1.36)	-0.34 (-2.30)**	-0.31 (-2.08)**	-0.27 (-1.78)*
<i>IPORET</i>	0.56 (7.86)***	0.53 (7.63)***	0.50 (7.22)***	0.50 (7.09)***
<i>IPOTOT</i>	-0.14 (-6.26)***	-0.02 (-0.84)	-0.05 (-2.23)**	-0.11 (-5.60)***
<i>AUDITD</i>	-0.23 (-0.06)	4.50 (1.14)	4.30 (1.09)	2.43 (0.61)
<i>LAGE</i>	-1.78 (-2.21)**	-1.66 (-2.10)**	-1.52 (-1.92)*	-1.37 (-1.72)*
<i>1/OFFER</i>	-477.03 (-12.98)***	-467.05 (-12.98)***	-463.22 (-12.86)***	-457.38 (-12.65)***
<i>PROCEEDS</i>	-12.46 (-8.31)***	-15.00 (-10.05)***	-15.20 (-10.18)***	-14.60 (-9.77)***
<i>DOTCOM</i>	27.04 (6.04)***	23.57 (5.34)***	24.95 (5.62)***	27.37 (6.21)***
Adjusted R ²	0.55	0.5689	0.5696	0.5655

The dependant variable is IPO turnover, a measure of the trading volume on the first day of trading (number of shares traded) scaled by the number of shares offered in the IPO (number of shares offered). The variables of interest are the interaction terms between taxes and underpricing. To avoid multicollinearity, the mean of each variable is subtracted first, and the interaction is calculated as the product of the de-meanned underpricing and tax variables. The initial return (*Underpricing*) is the difference between the first trading day closing price reported by CRSP and the initial offer price deflated by the offer price. Reputation of underwriters (*RANK*) using the Carter-Manaster ranking (Carter and Manaster, 1990). Pricing revision (*REVISION*) is the percentage price revision from midpoint of initial filing range to the offer price. Underwriters fees

(*SPREAD*) is the total underwriting/management/selling fees as a percentage of the amount offered in the IPO. The market return preceding sample IPOs (*VWTOT*) is the sum of the value weighted market return for the month of the IPO and the month prior to the IPO. The average IPO initial return during a firm's IPO month and the prior month is *IPORET* and the total number of IPOs during a firm's IPO month and the prior month is *IPOTOT*. *AUDITD* is a big-auditor dummy that equals to one if the auditor of the IPO firm is a big-8, 6 or 4 auditor. *1/OFFER* is the inverse of IPO offer price. *PROCEEDS* is the logarithm of IPO proceeds in millions, divided by CPI. *TECH* dummy is an indicator variable for technology firms that equals one for technology firms defined using the four-digit SIC codes in Cliff and Denis (2004). *VC* dummy is an indicator variable for venture capital backing that equals one where Thompson Financial recorded the IPO as backed by venture capital. *DOTCOM* dummy is an indicator variable that equals one for the time period January 1999 to March 2000. The numbers in parentheses are t-statistics, and all tests are two-tail tests. ***, ** and * represent significance levels at 1%, 5% and 10%, respectively.