Are Corporate Inversions Good for Shareholders?*

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ABSTRACT

Corporate inversion, the process of redomiciling for tax purposes, reduces corporate income taxes, but it also imposes a personal tax cost that is shareholder-specific. We develop a model, incorporating the corporate tax benefits and personal tax costs, to quantify the return to inversion for different shareholders. Foreign and tax-exempt investors, along with the CEO, disproportionately benefit. We show that an inversion simultaneously destroys wealth for many taxable shareholders. The model illustrates a novel agency conflict in which heterogeneity in personal taxes generates a wealth transfer between shareholders. Furthermore, personal taxes offset the loss in government revenue by 39%.

Keywords: Corporate inversions; Shareholder conflicts; Taxes; Tax-clientele effects; Mergers and acquisitions

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1 Introduction

Corporate inversion, the process by which a company reincorporates overseas for tax purposes, has become increasingly popular in recent years as a way to avoid the worldwide reach of the U.S. tax system.[1] In 2014 alone, U.S. public companies valued at over half a trillion dollars announced their intention to invert. While the corporate tax benefits of an inversion have received significant attention from the media and policymakers, these transactions also entail personal tax costs for the existing owners of the firm. In particular, U.S. law requires taxable shareholders to recognize a capital gains tax at the time of inversion, even if the shares are retained. Thus, while an inversion benefits shareholders by reducing a firm's corporate income taxes, it also imposes a cost on taxable shareholders as they lose the option to defer capital gains taxes on their shares.

We develop a model, incorporating both the personal tax costs and the corporate tax benefits, to evaluate a shareholder's net benefit from an inversion. The model illustrates how an individual's capital gains tax rate, cost basis, and age affect their private return from an inversion. For those shareholders that are tax-exempt or facing a low capital gains tax liability, the reduction in corporate taxes makes an inversion wealth-increasing. However, for taxable shareholders with a sufficiently low basis or high capital gains tax rate, we show that the personal tax costs can exceed the corporate tax benefits. For these investors an inversion is wealth-destroying. We show that an inversion gives rise to a novel conflict between a company's shareholders: it increases the wealth of some while destroying the wealth of others.

We then calibrate the model and quantify shareholder private returns to inversion in the historical sample of all U.S. public firms that have undergone an inversion. By observing the historical price path leading up to each inversion, we use the model to compute a shareholder's private return as a function of their holding period and tax rate. In the benchmark calibration, we find that the inversions in our sample are, on average, wealth-destroying for taxable shareholders, reducing value by 1.9%. For an investor with a holding period greater than 3 years, half of the inversions in our sample result in a negative after-tax return. Additionally, we construct a hypothetical example of an investor who is especially hurt by an inversion: an older shareholder facing California's top

[1] The United States is among a small minority of countries with a worldwide tax system: U.S. corporations incur a U.S. corporate income tax liability on earnings derived anywhere in the world. Although firms receive credit for foreign taxes paid, the U.S. corporate income tax rate exceeds most countries. Therefore, U.S. corporations operating in other countries are at a tax disadvantage relative to foreign firms.

capital gains tax rate who had planned to bequeath her shares. Across inversions in our sample, this investor loses 20.6% on average.

While inversions are wealth-destroying for many taxable shareholders, nontaxable shareholders benefit. The model-implied return for nontaxable investors, such as those holding shares in retirement accounts, is 4.9%. Because a significant fraction of shares are held by investors exempt from U.S. capital gains taxes, the aggregate effect across all shareholders—taxable and tax-exempt—is a 3.0% increase in value. However, whether an inversion is beneficial from the shareholder's perspective depends critically on the individual's personal tax status. So an inversion presents a dilemma in that differences in the personal tax statuses of shareholders can lead to disagreement over the optimal corporate policy.

Much of the policy response to corporate inversions has focused on the reduction in taxes paid at the corporate level, ignoring the capital gains taxes these transactions impose on taxable shareholders. We find that the capital gains taxes are large in aggregate, amounting to 39% of the present value of the reduction in corporate taxes. That is, the net loss in government tax revenue from an inversion is only 61% of the gross reduction in corporate taxes.

Given that an inversion benefits some shareholders while leaving others worse off, we next explore the CEO's return to an inversion. The CEO benefits, along with other shareholders, from the increase in the market price of the firm's equity. This increases the value of both the equity and option holdings of the CEO. However, only the directly held equity is subject to the capital gains tax from inversion. Using data on the option and stock holdings of each CEO in our sample of inverting firms, we show that the model-implied private return is significantly positive for the CEO even though they, along with other taxable shareholders, lose their ability to defer capital gains tax. Because of the tax-advantaged treatment of options, and the relatively high basis of shares held by CEOs, their private returns are significantly higher than for the average taxable shareholder. However, the private return to the CEO is comparable to the aggregate return to all shareholders, taxable and nontaxable. Therefore, the CEO's incentives are aligned with many, but not all, of the firm's shareholders.

Finally, we test whether personal tax consequences, for both the CEO and the shareholder base, predict the decision to invert. Using a logistic regression, we find that a firm is less likely to invert when its shareholders face higher personal tax costs. This is mostly due to the fact that inverting

firms are held disproportionately by nontaxable shareholders. Our results suggest a tax clientele effect where nontaxable shareholders either self-select into ownership of firms likely to invert or use their ownership to advocate for inversion. We also find that the CEO's total private return, coming from both their stock and option compensation, predicts inversion. This is driven largely by the fact that CEOs of inverting firms hold more options, which are not subject to capital gains tax at inversion. Overall, we find evidence that the CEO's private return and personal tax situation affect the decision to invert.

Our paper belongs to a large literature on the effect of taxes on corporate decision making. Graham (2003) provides a review of this literature. A subset of this literature explores the effect of personal taxation on corporate actions, most extensively with respect to payout policy (e.g., Lie and Lie (1999), Allen, Bernardo, and Welch (2000), Desai and Jin (2011)) and capital structure (e.g., Zechner (1990), Graham (1999), Lin and Flannery (2013)). We contribute to this literature by exploring the degree to which personal tax characteristics of shareholders affect the benefit and decision to redomicile outside the U.S.[2]

In terms of the model framework, our paper is closest to Morellec and Schürhoff (2010). They study the effect of personal capital gains taxes on a firm's investment and financing decisions. Green and Hollifield (2003) study the effect of personal taxes on a firm's cost of equity financing and optimal capital structure decisions. In contrast, we abstract from a firm's investment and financing decisions and instead focus on the effects of an inversion. More generally, our model framework belongs to the broad class of contingent claims models used in corporate finance.[3] We build on this literature by showing how personal tax effects can give rise to conflicts among shareholders with respect to optimal corporate policy. We show that heterogeneity in personal taxes can generate significant dispersion in the shareholder private returns to an inversion.

A small but growing literature studies corporate inversion and tax policy on multinational corporations. A few papers following the first wave of inversions investigate the announcement returns and effects on firm value of inversion, for example Desai and Hines (2002), Cloyd, Mills, and Weaver (2003), and Seida and Wempe (2003). More recent work has shown that the high

[2]Our paper also relates to a literature that studies the effect of personal taxes on an investor's optimal consumption and portfolio decisions. See, for example, Constantinides (1983), Constantinides (1984), Dammon, Dunn, and Spatt (1989), and Dammon, Spatt, and Zhang (2001). See Dammon and Spatt (2012) for an overview.

[3]See Strebulaev and Whited (2011) for a survey.

tax cost of repatriation has contributed to a significant increase in corporate cash holdings (Foley, Hartzell, Titman, and Twite (2007)) and this unrepatriated cash has resulted in distortions in investment and the M&A market (Bird, Edwards, and Shevlin (2015), Hanlon, Lester, and Verdi (2015), and Edwards, Kravet, and Wilson (2015)). Additionally, Clausing (2015) shows that firms may actively shift their profits to low-tax countries to reduce corporate tax liabilities. We contribute to this literature by quantifying the costs and benefits of reincorporating in a low-tax country as well as the heterogeneous effects on shareholders.

Our paper also relates to the relationship between CEO incentives, monitoring, and the implementation of tax strategies. For instance, Bird and Karolyi (2015) find that increased institutional ownership leads to lower effective tax rates and more sophisticated tax strategy. This is consistent with our findings that firms which have a higher level of institutional ownership are more likely to invert. Desai and Dharmapala (2006) explore the relationship between high-powered incentives for managers and how this affects their incentive to engage in tax avoidance. Bennedsen and Zeume (2015) find that managers may use the opacity created by the use of tax havens to expropriate value from shareholders. We show that CEOs' private incentives predict inversion activity, while at the same time institutional investors—an important source of monitoring—may disproportionately benefit from inversion. This suggests a potential weakness in corporate governance relating to decisions that heterogeneously affect shareholders.

A significant literature demonstrates that heterogeneous private benefits and inventives among shareholders within a firm can affect corporate policy and firm value. Claessens, Djankov, Fan, and Lang (2002) find that firm value is increasing in the cash flow rights of the largest shareholder. Bae, Kang, and Kim (2002) find evidence that controlling shareholders with cross-ownership through a business group engage in acquisitions to create private wealth at the expense of minority shareholders, an action called "tunneling."[4] Similarly, cross-ownership by institutional investors may help to explain acquisition activity that results in negative returns to shareholders (see Matvos and Ostrovsky (2008), Ferreira, Massa, and Matos (2010), and Harford, Jenter, and Li (2011)). Our paper provides another example of a transfer of wealth between shareholders within the firm, in which foreign investors, tax-advantaged shareholders, and the CEO benefit from inversion while value is destroyed for many taxable shareholders. We also find evidence that institutional investors

[4]See also Cheung, Rau, and Stouraitis (2006) and Jiang, Lee, and Yue (2010).

may advance corporate policy decisions that are detrimental to some shareholders.

The paper proceeds as follows. In Section 2 we describe our hand-collected data on corporate inversions and present descriptive statistics for the sample. Section 3 discusses the tax consequences of inversion and develops a model to value the tax benefits and costs of inversion. After exploring the model framework and comparative statics, we use the model to measure the investor's private return based on their individual holding period and tax basis. Section 4 uses our data and model to quantify the private benefits to the CEO of inversion and tests whether personal tax consequences, for both the CEO and the shareholder base, predict the decision to invert. Section 5 concludes.

2 Data

In this section we describe the construction of our population of inversion transactions by U.S. public companies. We examine the historical volume of inversion activity and present descriptive statistics comparing inverting firms to the broader population of U.S. public companies in Compustat.

2.1 Inversion population description

We construct a novel dataset of all inversion transactions by U.S. public companies over the period 1993–2015, consisting of a total of 60 transactions. We hand collect the sample of inverting companies using a variety of sources. We use the CRSP/Compustat Merged dataset to identify years in which U.S. firms changed their country of incorporation. These observations were cross-referenced with SEC filings and press releases from the company to determine the details of the transaction, such as announcement date and tax treatment, and whether it should be classified as an inversion. For cases that involve a merger, these inversion data are supplemented with data from SDC Platinum.

For the presentation of descriptive statistics, we define two types of inversion transactions. The first, which we refer to as a "naked inversion," occurs when a foreign subsidiary of a U.S.-incorporated multinational becomes the parent, thus changing the company's country of incorporation. This foreign subsidiary may or may not have substantial business activities. The second type of transaction, a "merger inversion," occurs when a U.S. company acquires a foreign company and the combined company incorporates in a foreign jurisdiction.[5] Note that we do not classify U.S.

[5]Prior to 2004, a U.S. corporation could invert without any foreign assets or activities. Following the pas-

firms acquired by foreign companies to be an inversion. Of the 60 announced inversion transactions, 25 and 35 are of the naked and merger types, respectively.

2.2 Inversion volume and summary statistics

In Figure 1, we plot the historical volume of inversion activity. In each panel of the figure, we report the number of announced inversions represented with bars (left axis), as well as the dollar volume of announced inversions represented by the solid black line (right axis). We compute the dollar value of an inversion transaction as the sum of the market value of equity and book value of debt immediately prior to the announcement. Panel A plots the total inversion activity, and Panels B and C show the activity disaggregated into naked and merger inversions, respectively. As shown in Panel A of the figure, in recent years the volume of inversion activity has grown substantially, and nearly half of all inversions have occurred in the last five years of our sample. In 2014, there was over $500 billion in proposed inversion activity by U.S. public firms.

In Table I we present summary statistics for a number of firm characteristics for the set of inverting firms in our sample. Detailed variable definitions that are used throughout the paper are given in Appendix B. The first three columns report statistics for the full set of inversions, naked inversions, and merger inversions, respectively. The final column reports statistics for the entire sample of CRSP/Compustat firms for the period 1993–2015 as a basis for comparison.[6] The table shows that inverting firms tend to be larger, have higher earnings, and have a higher share of foreign taxes, than the average Compustat firm. However, along many other dimensions, inverting

sage of the American Jobs Creation Act of 2004, Congress added Section 7874 to the IRS code that required the inverting firm to have substantial foreign activities in order to be considered a foreign entity for tax purposes after the inversion. See VanderWolk (2010) for details of Section 7874. The legislation introduced significant uncertainty over the potential tax treatment of these transactions, and the IRS interpretation of the legislation has changed somewhat over time. Today, following guidance from the IRS in 2012, the firm is generally able to satisfy the substantial business activities exception by having "at least 25 percent of each of the group employees, group assets, and group income to be located or derived in the relevant foreign country" (Herzfeld (2014)). We include in our sample only those inversions in which the U.S. firm successfully redomiciles for tax purposes. The introduction of Section 7874 made naked inversions more difficult, leading many U.S. firms to execute inversion transactions as a two-step process: acquire a foreign firm, thereby establishing significant business activities in the foreign country required by Section 7874, and then immediately reincorporate the combined firm in the relevant foreign country. The legislation led to a decline in naked and an increase in merger inversions in the post-2004 period. Interestingly, Section 7874, which was designed to discourage corporations from leaving the U.S., creates an incentive for U.S. companies to move or increase operations outside the U.S. in order to fulfill the substantial business activities exception.

[6] We restrict the sample to firms with at least $1 million in book assets, and winsorize variables at the one percent level to eliminate the effect of outliers.

firms look similar to the broader population of U.S. public firms. Surprisingly, the foreign share of earnings for inverting firms is not substantially higher than for the average firm that reports this information.[7]

In Figure 2 we display the inversion volume within each of the Fama-French 38 industries. The figure shows all proposed inversions by public U.S. companies by the date of announcement. The black circles denote a naked inversion and the red correspond to a merger inversion. The size of a circle represents the market value of the transaction, which is computed as the sum of the market value of equity and the book value of debt for the inverting firm. Industries with no recorded inversions are not shown. As indicated by the figure, there is significant heterogeneity in the frequency of inversions across industries. In particular, inversions over the last few years has been concentrated within the "Chemical" industry, most of which are in the areas of pharmaceuticals and biotechnology.

3 Quantifying the Costs and Benefits to Shareholders

The U.S., unlike most other countries in the world, taxes corporate earnings that are derived anywhere in the world, not just within its borders. For this reason, a foreign corporation has a significant tax advantage when doing business outside the U.S. compared to a U.S.-incorporated firm. Firms are able to reduce their corporate tax liability by inverting to a foreign country. Although the details of the tax code are complicated, major benefits of inversion include avoiding U.S. taxation on future and unrepatriated past earnings from foreign sources, and an increased ability to shift profits to low-tax jurisdictions.[8] All shareholders benefit from this reduced corporate income tax liability resulting from inversion.

Inversions also entail a personal tax cost. Prior to 1996, any U.S. corporation could renounce its U.S. tax status by creating a non-U.S. subsidiary, often in Bermuda or the Cayman Islands, which impose no corporate income tax, and having the U.S. parent "invert" its corporate structure with that subsidiary. However, following a highly publicized inversion of the cosmetics company

[7]Note that only about a quarter of firms in Compustat report earnings divided into foreign and domestic sources.

[8]Congress has consistently granted firms the ability to defer taxes on foreign income if these earnings are kept with the foreign subsidiary. Foley, Hartzell, Titman, and Twite (2007) show that firms hold substantial cash overseas in large part to avoid this cost of repatriation. The ability of U.S. firms to defer this corporate income tax indefinitely likely lowers the effective tax benefit of inversion.

Helen of Troy, the Internal Revenue Service modified Section 367(a) to make an inversion trigger a capital gains tax realization for U.S. shareholders, even if they retain their shares following the inversion.[9] Thus, both naked and merger inversions are taxable events for U.S. shareholders.[10]

This capital gains tax, created by the IRS in order to deter expatriation, imposes a cost on individual shareholders as a result of actions taken by the corporation they own. As the tax is only imposed on the amount in excess of the shareholder's individual tax basis, this tax penalty will impact each shareholder differentially depending on the tax status of her account, the original price paid for her shares, and the capital gains tax rate faced. This cost is zero for tax-exempt investors and can be minimal for many short-term taxable investors. However, for long-term investors with large capital gains, this cost can be significant. The cost is especially large for investors who plan to bequest their shares upon death, as the capital gains tax basis on inherited shares is reset to the current market price at the time of death.[11] In this way, even long-term shareholders can significantly reduce or avoid entirely capital gains tax on their shares.

Even for investors who do not plan to bequeath their holdings, the cost of being forced to realize a capital gain early can be large. This early realization of capital gains is costly in that the investor receives returns on the deferred tax liability embedded in her holdings for as long as the shares are held. Once the shares are sold, that deferred tax liability becomes an immediate one, and the option to defer is lost. Therefore, the ability to choose the optimal time to sell shares is a valuable option, and this value depends on the shareholder's personal cost basis. In order to quantify the costs and benefits of corporate inversion to individual shareholders, we develop a model that accounts for the tax-timing option implicit in the individual investor's position, as well

[9]The legislation was retroactive to the Helen of Troy inversion, the first inversion in our sample, which was announced in 1993 and completed in 1994.

[10]This applies to transactions where shareholders of the U.S. company own more than 50 percent of the shares, by value or voting power, after the combination with the non-U.S. firm. These shareholder-taxed inversions are called "flip" transactions. Under certain circumstances, the firm may be able to structure the inversion as an "outbound F" reorganization, which imposes taxes at the corporate level rather than on the shareholder. However, due to the strict requirements necessary to perform the latter reorganization, the vast majority of deals are shareholder-taxed. In addition, outbound F deals are generally only feasible when the embedded capital gains for shareholders is small, making the distinction negligible for these types of deals. In the case that the inverting U.S. firm is acquired by a larger foreign corporation, the tax treatment of the transaction is the same as for U.S. domestic mergers. We exclude from our sample those inversions that are not shareholder taxable.

[11]For a spousal bequest, the basis is set to the midpoint between the current market price and original basis, a "half step up."

as the corporate tax benefits resulting from an inversion.

3.1 Model

Our model framework follows Constantinides (1983) and Morellec and Schürhoff (2010). We assume that the equilibrium market price is determined by the marginal, or representative, investor. We then use this equilibrium market price to estimate the private value of inversion for an individual shareholder that faces a personal tax rate that may differ from this marginal investor. This allows us to quantify the net benefits of inversion for different classes of shareholders, as well as for shareholders in aggregate.

Time is continuous and all agents are risk-neutral with a constant after-tax discount rate of r. The firm is assumed to be entirely equity-financed with earnings before interest and taxes (EBIT), X_t, evolving as

$$dX_t = \mu X_t dt + \sigma X_t dW_t \tag{1}$$

where $X_0 > 0$ and W_t is a standard Brownian motion. Corporate earnings are taxed at rate τ_c. Equity holders face a personal tax rate on distributions of τ_d and pay a capital gains tax upon realization at rate τ_g.[12] Given that capital gains are taxed upon realization, each investor's share embeds a tax-timing option. Fundamentally, this implies that shareholders with different bases will differ in their valuation of the shares they hold, even with identical beliefs and expectations for firm cash flows.

Investors are subject to liquidation shocks that occur as a Poisson arrival with intensity ξ. We assume an investor's liquidation shock is uncorrelated with the firm's returns and occurs for various exogenous reasons, one of which is an investor's death. In the case of an investor's death, we assume that the shares are bequeathed and, consistent with the U.S. tax code, receive a free step-up in basis, thus avoiding the capital gains tax. In all other cases of investor liquidation, the shares are subject to capital gains tax τ_g. We use $\tilde{\tau}_g$ to denote the investor's expected capital gains tax rate upon liquidating.

We define $v(x; B)$ as the private valuation of a shareholder with basis B when the firm's current cash flow level is x. The market stock price is denoted by $p(x)$. Additionally, let x_B denote the

[12]For tractability, we do not distinguish between dividends and repurchases. Green and Hollifield (2003) consider this distinction in evaluating the magnitude of the personal tax benefits to equity financing.

optimal threshold for the firm's cash flow that triggers the sale of a share for an investor with basis B. It can be shown that an investor in this environment optimally defers capital gains and immediately realizes capital losses.[13] This implies that the optimal tax-loss selling threshold, x_B, is given by

$$p(x_B) = B. \tag{2}$$

The equilibrium market price of the equity claim is set by new investors, who enter with a tax basis equal to the current market price. Thus, the market price encompasses an at-the-money capital gains tax-timing option. The relation between the private valuation and the market price is characterized by the fixed-point

$$p(x) = v(x; p(x)). \tag{3}$$

In other words, the market price is the private valuation of an investor with a basis equal to the current market price.

3.1.1 Inversion

From a shareholder's perspective, an inversion occurs as an exogenous Poisson arrival with intensity λ. Thus, over the time interval dt, there is a probability λdt that the firm inverts. Upon inverting, the firm's effective corporate tax rate changes from τ_c to τ_c^I, where $\tau_c^I < \tau_c$. We assume no other parameters of the firm change as a result of the inversion. That is, all the benefits from inversion—whether through reduced taxes on future foreign earnings or unrepatriated cash, or through profit shifting—are captured in the model by a reduction in the firm's effective corporate tax rate. In what follows, we will use $v(x; B)$ and $p(x)$ to denote pre-inversion values and $v^I(x; B)$ and $p^I(x)$ to denote post-inversion values.

Following the current personal tax treatment for investors in an inversion transaction, we assume that taxable investors are required to realize their capital gains tax liability at the time the inversion occurs.[14] Consequently, when an inversion occurs, a taxable shareholder with basis B has a net

[13] See Constantinides (1983) or Morellec and Schürhoff (2010) for a proof.

[14] The investor's capital gains tax is actually realized at the completion of the inversion transaction, which will be after the inversion announcement date. For simplicity, we model the inversion announcement and completion as occurring simultaneously. Given that this period is typically relatively short—the median number of months between announcement and completion is 4.3—this simplification should have little effect on our results. Put differently, the investor in reality has a tax-timing option between the announcement and completion dates, though for short intervals the value of this option will be negligible.

payoff of

$$p^I(x) - \tau_g(p^I(x) - B) - v(x; B). \tag{4}$$

The first term of equation (4) is the market price of the share of the inverted firm, given the cash flow level x. The second term is the capital gains tax that the shareholder is required to pay as a result of the inversion: a tax at rate τ_g on the difference in the market price at inversion and their personal basis, B. The third term captures the fact that the shareholder gives up her private valuation of the share at cash flow level of x with a basis of B.

As we will later show, the expression in Equation (4) can take positive or negative values, depending on the model parameters and shareholder's basis. Intuitively, for the inversion to be attractive to the investor, the present value of a decreased corporate earnings tax needs to be sufficiently large to offset the cost of losing the capital gains tax-timing option. The former is a benefit common to all shareholders, however, the cost of the lost tax-timing option will be specific to the investor as it depends on her effective capital gains tax rate as well as her basis.

3.1.2 Valuation

We now derive the investor's private valuation and the market price of equity for the firm. We begin by deriving the values for the post-inversion firm and then proceed to the pre-inversion firm.

For an individual investor with basis B, her private valuation of a share in the post-inversion firm satisfies the following ordinary differential equation:

$$\frac{\sigma^2}{2}x^2 v^I_{xx}(x; B) + \mu x v^I_x(x; B) + \xi[(1-\tilde{\tau}_g)p^I(x) + \tilde{\tau}_g B - v^I(x; B)] + (1-\tau_d)(1-\tau^I_c)x = r v^I(x; B). \tag{5}$$

At any time, an investor with basis B could sell her share of the post-inversion firm at price $p^I(x)$ and receive after tax proceeds of

$$(1 - \tau_g)p^I(x) + \tau_g B. \tag{6}$$

This implies that the ODE in Equation (5) is subject to the following boundary conditions:

$$v^I(x; B) = (1 - \tau_g)p^I(x) + \tau_g B \qquad \text{for } x = x_B \tag{7}$$

$$v^I_x(x; B) = (1 - \tau_g)p^I_x(x) \qquad \text{for } x = x_B, \tag{8}$$

where equations (7) and (8) are the value matching and smooth pasting conditions, respectively. Expressions for the investor's private valuation $v^I(x; B)$, the optimal selling threshold x_B, and the

market price $p^I(x)$ for the post-inversion firm can be solved for analytically and are presented in the following proposition.

Proposition 1. *Given current cash flow level x, an investor with basis B has a private valuation of the post-inversion firm's equity given by*

$$v^I(x;B) = \left(\frac{x}{x_B}\right)^{-\gamma_1}\Big(p^I(x_B) - h(x_B;B)\Big) + h(x;B), \tag{9}$$

where the function h is defined as

$$h(x;B) = \frac{(1-\tau_d)(1-\tau_c^I)x}{r+\xi-\mu} + \frac{\xi(1-\tilde{\tau}_g)p^I(x)}{r+\xi-\mu} + \frac{\xi\tilde{\tau}_g B}{r+\xi} \tag{10}$$

and γ_1 is given by

$$\gamma_1 = \frac{1}{2} - \frac{\mu}{\sigma^2} + \sqrt{\left(\frac{\mu}{\sigma^2} - \frac{1}{2}\right)^2 + \frac{2(r+\xi)}{\sigma^2}}. \tag{11}$$

The market price of the post-inversion firm, given current cash flow level of x, is

$$p^I(x) = \left(\frac{(1+\gamma_1)\eta^I}{(1+\gamma_1)(1-\omega^I) - \tau_g - \frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}}\right)x \tag{12}$$

where

$$\eta^I = \frac{(1-\tau_d)(1-\tau_c^I)}{r+\xi-\mu} \qquad \textit{and} \qquad \omega^I = \frac{\xi(1-\tilde{\tau}_g)}{r+\xi-\mu}. \tag{13}$$

For an investor with basis B, the optimal post-inversion selling threshold is given by

$$x_B = \left(\frac{(1+\gamma_1)(1-\omega^I) - \tau_g - \frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}}{(1+\gamma_1)\eta^I}\right)B. \tag{14}$$

Proof. See Appendix A. □

Equation (9) shows that an investor's private valuation for the share includes the value of a capital gains tax-timing option. In particular, the price of an Arrow-Debreu security that has a payoff equal to 1 at the first hitting time of $x = x_B$ is given by $\left(\frac{x}{x_B}\right)^{-\gamma_1}$. The value of the tax-timing option, and therefore the shareholder's private valuation of a share, depends on her basis.

We now proceed to characterize the investor private valuation and the market price for a firm that has not undergone an inversion. For an investor with basis B, the private valuation of the pre-inversion firm, $v(x;B)$, satisfies the following ODE:

$$\begin{aligned}&\frac{\sigma^2}{2}x^2 v_{xx}(x;B) + \mu x v_x(x;B) + \xi[(1-\tilde{\tau}_g)p(x) + \tilde{\tau}_g B - v(x;B)]\\ &+ \lambda[(1-\tau_g)p^I(x) + \tau_g B - v(x;B)] + (1-\tau_d)(1-\tau_c)x = rv(x;B).\end{aligned} \tag{15}$$

As with the post-inversion firm, at any time an investor with basis B could sell her share at the current pre-inversion market price, $p(x)$, and receive after tax proceeds of

$$(1-\tau_g)p(x)+\tau_g B. \tag{16}$$

Thus, the ODE in Equation (15) is subject to value-matching and smooth pasting conditions analogous to those in Equations (7) and (8) for the post-inversion valuation. The private valuation and market price of the pre-inversion firm are given in the following proposition.

Proposition 2. *Given current cash flow level x, an investor with basis B has a private valuation of the pre-inversion firm's equity given by*

$$v(x;B)=\left(\frac{x}{x_B}\right)^{-\beta_1}\Big(p(x_B)-g(x_B;B)\Big)+g(x;B) \tag{17}$$

where the function $g(x;B)$ is defined as

$$g(x;B)=\frac{(1-\tau_d)(1-\tau_c)x+\xi(1-\tilde{\tau}_g)p(x)+\lambda(1-\tau_g)p^I(x)}{r+\xi+\lambda-\mu}+\frac{(\xi\tilde{\tau}_g+\lambda\tau_g)B}{r+\xi+\lambda}, \tag{18}$$

and β_1 is given by

$$\beta_1=\frac{1}{2}-\frac{\mu}{\sigma^2}+\sqrt{\left(\frac{\mu}{\sigma^2}-\frac{1}{2}\right)^2+\frac{2(r+\xi+\lambda)}{\sigma^2}}. \tag{19}$$

Let

$$\eta=\frac{(1-\tau_d)(1-\tau_c)}{r+\xi+\lambda-\mu},\qquad \omega=\frac{\xi(1-\tilde{\tau}_g)}{r+\xi+\lambda-\mu},$$
$$\Lambda=\frac{\lambda(1-\tau_g)}{r+\xi+\lambda-\mu},\qquad \Theta=\frac{\xi\tilde{\tau}_g+\lambda\tau_g}{r+\xi+\lambda},$$
$$A^I=\frac{(1+\gamma_1)\eta^I}{(1+\gamma_1)(1-\omega^I)-\tau_g-\frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}},$$

The market price of the pre-inversion firm is given by

$$p(x)=\left(\frac{(1+\beta_1)(A^I\Lambda+\eta)}{(1+\beta_1)(1-\omega)-\beta_1\Theta-\tau_g}\right)x. \tag{20}$$

For an investor with basis B, the optimal pre-inversion selling threshold is given by

$$x_B=\left(\frac{(1+\beta_1)(1-\omega)-\beta_1\Theta-\tau_g}{(1+\beta_1)(A^I\Lambda+\eta)}\right)B. \tag{21}$$

Proof. See Appendix A. □

3.1.3 Private return to a shareholder

We define the private return from inversion, $r^I(x;B)$, for a shareholder with basis B as:

$$\frac{(1-\tau_g)p^I(x)+\tau_g B}{v(x;B)}-1. \tag{22}$$

The numerator gives the after-tax value of the firm immediately following inversion. The private return is this post-inversion value normalized by the shareholder's private valuation immediately prior to the inversion announcement, $v(x;B)$. This private return captures the increased cash flows resulting from a lower corporate tax rate net of the personal tax cost of losing the tax-timing option. The private return to an individual investor is less than the market return to inversion $(p^I(x)/p(x)-1)$ due to the shareholder's personal tax liability and the loss of the tax-timing option.

In the model, the equilibrium market price depends on the marginal investor's capital gains tax rate τ_g, among other parameters. Given that equilibrium market price, we can use the model to quantify the private returns from inversion for an individual shareholder j with capital gains tax rate τ_g^j, which may differ from the marginal investor's rate τ_g. The private return to this individual investor with tax rate τ_g^j and basis B is:

$$\frac{(1-\tau_g^j)p^I(x)+\tau_g^j B}{v(x;B,\tau_g^j)}-1, \tag{23}$$

where this investor's private valuation, $v(x;B,\tau_g^j)$, depends on her individual tax rate. Given the structure of the model, we can express the private return to an investor as a function of her basis-to-price ratio and individual capital gains tax rate: $r^I(B/p;\tau_g^j)$. This form will be useful when we empirically evaluate the model in order to quantify the private returns to an inversion for shareholders with different capital gains tax rates.

3.2 Comparative Statics

In Figure 3 we present comparative statics illustrating how an investor's basis and capital gains tax rate affect her private valuation and return to an inversion. In each panel, we consider three different values of an individual investor's capital gains tax rate ($\tau_g^j = \{0.203, 0.253, 0.33\}$) for an individual, taxable investor. We hold the tax rate of the marginal investor as well as the other parameters of the model fixed at their benchmark values given in Table II. We defer discussion of the calibration of these parameters to Section 3.3.

In Panel A of Figure 3, we plot the ratio of the shareholder's private valuation to the market price, $v(x; B, \tau_g^j)/p(x)$, for the pre-inversion firm as a function of the investor's basis-to-price ratio. Intuitively, the basis is irrelevant for a tax-exempt investor and her private valuation is equal to the market price for any value of the basis. However, for an investor with a positive capital gains tax rate and a basis below the market price ($B/p(x) < 1$), her private valuation of a share is less than the market price. The plot shows that this wedge between private valuation and market price is increasing in the investor's capital gains tax rate and decreasing in her basis-to-price ratio.

Panel B of Figure 3 plots a shareholder's after-tax private return from an inversion as a function of her individual basis-to-price ratio (B/p) and capital gains tax rate (τ_g^j). This private return, computed from the model, is defined in Section 3.1.3. As before, we plot the return for three cases of a shareholder capital gains tax rate. The black dotted line in Panel B displays the market return to an inversion in the model. This market return does not capture the effect of personal taxes and corresponds to the inversion return for tax-exempt investors. The figure shows that, for a taxable investor, the return to an inversion is strictly below the market return.

Intuitively, losing the capital gains tax-timing option is more costly for an investor with a higher tax liability, resulting from either a low basis or a high capital gains tax rate. Thus, the return to an inversion is lower for investors with a low basis-to-price ratio and/or a high capital gains tax rate. The figure shows that the return to an inversion differs significantly among shareholders according to their basis and capital gains tax rate. Furthermore, the figure shows that for a significant range of capital gains tax rates and bases, the return to an inversion is negative. For these taxable investors, the inversion is wealth-destroying.

3.3 Calibration

In calibrating the model, we choose parameters to match common values used in the prior literature, as well as to match specific empirical moments of interest in this study. The benchmark parameters, reported in Table II, are chosen to represent an average firm and investor. In later sections, we explore how variations in the parameters, particularly an investor's capital gains tax rate, affect our estimates of the return to an inversion.

For the preference and technology parameters—the discount rate r, cash flow growth rate μ, and cash flow volatility σ—we select parameters consistent with values commonly used in related

contingent claims models (e.g., Leland (1994), Morellec and Schürhoff (2010), and Strebulaev and Whited (2011)).

To calibrate the corporate tax rates used in the model, we first choose the pre-inversion tax rate, τ_c, to match the U.S. corporate tax rate faced on U.S. income by the sample of inverting firms prior to inversion. Second, we choose a post-inversion corporate tax rate to match the reduction in this rate resulting from the three main benefits of inversion: 1) avoiding U.S. taxation on future foreign earnings, 2) increased ability to "shift" U.S. profits to foreign subsidiaries, and 3) avoiding repatriation tax on past foreign earnings held as cash overseas.[15] The model structure allows us to incorporate all of the benefits of inversion into a single parameter, the post-inversion corporate income tax rate τ_c^I.

We use Compustat data on income and taxes disaggregated into foreign and domestic sources. As those firms with greater tax benefit to inversion are more likely to invert, we use the sample of inverting firms to estimate the tax rates. First, we estimate the pre-inversion tax rate. Using the three years of income and tax data prior to the inversion announcement, we estimate the U.S. federal income tax rate on U.S.-source income to be 24.4%, with an additional state rate of 2.0%.[16] As U.S. states do not tax foreign income, and the foreign share of income is 63%, this gives a pre-inversion combined average tax rate, τ_c, of 25.1%.[17]

Second, we estimate the post-inversion corporate tax rate that matches the three benefits of inversion. We estimate the foreign tax rate on foreign income to be 18.6% for firms that inverted. By inverting, the firm avoids paying U.S. federal taxes on this foreign-source income, resulting in a post-inversion combined tax rate τ_c^I of 21.4%. However, this rate only incorporates the reduced tax rate on future foreign income. We next account for the benefits of the increased ability to profit shift and the avoidance of repatriation tax on foreign cash by adjusting downward τ_c^I. We do this using two scenarios, the first corresponding to a representative, or median, set of assumptions, and

[15]Profit shifting, sometimes referred to as earnings stripping, is the process by which firms move their U.S. earnings, in an accounting sense, to foreign subsidiaries, for example by engaging in parent-subsidiary loans or leases; see Clausing (2015).

[16]This effective average tax rate is calculated as the sum of non-negative taxes paid over the sum of non-negative income.

[17]The pre-inversion tax rate (τ_c) is the effective rate that firms would pay on repatriated foreign earnings, which are often deferred indefinitely. To the extent that firms expect to pay less than the current repatriation rates, for example through future tax reform or a repatriation holiday, the estimated pre-inversion tax rates will overstate the benefit of inversion.

the second an aggressive, high-end estimate of the benefits.

To account for the benefit of the increased ability to shift profits, we assume that U.S. earnings will be reduced post inversion by some fraction, and that foreign earnings will increase by that same dollar amount, thus increasing the foreign share of earnings. In the benchmark case, we assume that inversion allows firms to shift an additional 20% of their U.S. earnings to foreign jurisdictions, while we assume firms can shift 40% in the aggressive case. This corresponds to a reduction in the post-inversion tax rate τ_c^I of 0.5 and 1.1 percentage points for the benchmark and aggressive cases, respectively.

Finally, to account for the avoidance of U.S. taxes on past foreign earnings, we estimate the cost of repatriation using an approach similar to that of Foley, Hartzell, Titman, and Twite (2007). The median ratio of cash to market value of equity for inverting firms is 0.08. We assume that 53% of that cash is held abroad, which is the proportion of foreign-held cash reported by Faulkender, Hankins, and Petersen (2015) for the sample of firms in the BEA multinational survey. For the benchmark case, we assume the cost of repatriation is the difference between the U.S. federal rate and the foreign rate. This gives an estimate of the cost of repatriating all foreign deferred earnings as 0.25% of equity value. We use the model-implied elasticity of the market value of equity with respect to the corporate income tax rate to construct the change in the corporate tax rate that corresponds to this increase in equity value.[18] This implies that in our benchmark case the avoidance of taxes on unrepatriated foreign earnings corresponds to a 0.19 percentage point reduction in the firm's post-inversion effective corporate tax rate. For the high-end estimate of the benefit we assume 15% of the firm's equity value is in the form of unrepatriated foreign cash, and that the cost of repatriating would be 20%. This implies a savings of 3% of equity value from inversions, which corresponds in the model to a 2.39 percentage point reduction in the post-inversion corporate tax rate, τ_c^I, under the aggressive assumptions. Taking all three benefits into account, this results in a final post-inversion corporate tax rate τ_c^I of 20.7% and 17.9% for the benchmark and aggressive cases, respectively.

We set the inversion arrival intensity parameter, λ, equal to 0.01 to match the empirical inversion frequency for multinational corporations in industries that have seen significant inversion activity.[19]

[18] The elasticity of the market value of equity with respect to the corporate income tax rate (τ_c) is $-\tau_c/(1-\tau_c)$.

[19] We define multinationals as firms with at least a quarter of their taxes and earnings classified as foreign.

In addition, the post-inversion corporate tax rate and the inversion arrival intensity jointly determine the gains from inversion. We can therefore use the announcement returns observed around inversion announcement as an additional check on our choice of these parameters. The average three-day return around announcement is 3.8% in excess of the market, which is roughly consistent with the model estimated return of 4.9%. This provides some reassurance that we are not understating the corporate income tax benefit of inversion, and that the model adequately captures the gains from inversion.

We calibrate the investor parameters for a representative, marginal investor. In later sections, we will compute private returns for individual investors that differ in their capital gains tax rate. The calibration of the marginal investor's capital gains tax rate is complicated by the fact that this rate varies both over time and across investors, depending on their income bracket as well as country and state of residence. Over our sample period, the top U.S. federal statutory capital gains tax rate ranges between 15% and 28%. Additionally, the state-level capital gains tax rates vary between 0 and 13.3% during this period. We assume the representative U.S. taxable investor faces federal and state-level capital gains tax rates equal to the average top marginal rate.[20] Accordingly, we assume a 20% federal and 5.3% state-level capital gains tax rate, for a total capital gains tax rate of 25.3% for a taxable investor.[21]

In setting the marginal investor's capital gains tax rate τ_g, we then calculate the fraction of shareholders that are subject to capital gains taxes. We use data for the third quarter of 2015 from the Federal Reserve's Flow of Funds Table L.223, which provides a breakdown of the ownership of U.S. corporate equity by category of investor. For nonprofits, government, and pension holdings, we assume a capital gains tax rate of zero. Additionally, the table provides a breakdown of equity owned directly by U.S. households as well as that held by mutual funds and ETFs.[22] In these

We focus on industries that experienced at least five inversions; these industries account for three quarters of all inversions.

[20]The U.S. Treasury reports an average effective capital gains tax rate based on taxes paid; see U.S. Treasury (2016). Over our sample period, the ratio of this reported average effective rate to the top federal statutory rate was about 0.96, supporting our assumption that the marginal investor in the model effectively faces the top marginal capital gains tax rate.

[21]There was not significant variation in the top federal capital gains tax rate across inversions in our sample. The top federal tax rate was 20%, our assumed rate, in about three-quarters of the inversion transactions in our sample, corresponding to about 90% of the dollar volume.

[22]The Flow of Funds Table L.223 reports an aggregated value of equity held by households and nonprofit organizations. Until 2000, it provided separate values for the holdings of nonprofits and households. We use the ratio of household to nonprofit holdings in 2000 to approximate the household's value of holdings in

cases, the equity may be held in either a taxable or a tax-deferred/tax-exempt account. The 2015 Investment Company Fact Book reports that 58% of mutual fund assets are held in tax-deferred or tax-exempt accounts. Thus, we assume that 42% of mutual fund and ETF holdings are held by taxable investors facing a capital gains tax rate of 25.3%. Finally, for equity held by foreign investors, we assume a capital gains tax rate of 23.2%, which is the average top statutory rate among OECD countries as reported by Pomerleau (2015). Ultimately, this gives a weighted average capital gains tax rate for the marginal investor of 16.1%. We assume this tax rate on dividends as well.

The parameter ξ determines the frequency of liquidation shocks experienced by an investor. In the model, an investor sells shares either due to a liquidation shock or when the market price falls to the level of her basis. Thus, we calibrate the ξ parameter such that the total turnover frequency in the simulated model equals 42%, the asset-weighted annual turnover rate for equity investors as reported in the 2015 Investment Company Fact Book. This gives an annualized value of $\xi = 0.075$.

As discussed in Section 3.1, we assume a portion of investor liquidation shocks arise from the investor's death, in which case there is a free step-up of the basis, and capital gains taxes are not paid. Thus, for a taxable investor, the expected capital gains tax rate for a liquidation shock is given by:

$$\tilde{\tau}_g = (1 - \xi_d/\xi)\tau_g \tag{24}$$

where ξ_d/ξ denotes the proportion of investor liquidation resulting from death. We choose a value of $\xi_d = 0.034$, which corresponds to the life expectancy of a 50-year old American as reported in the Social Security Administration's 2011 actuarial period life table. This results in a value of $\tilde{\tau}_g = 0.088$.

3.4 Model-Implied Shareholder Return from Inversion

The model provides a framework to quantify the benefits of reducing the corporate income tax rate and the shareholder cost of triggering a capital gains tax event. In this section we use the model to estimate the private returns for taxable shareholders as a function of their personal tax basis for the sample of firms that have undergone inversion.

For each firm, there exists an entire distribution of shareholder tax bases based on when they purchased the shares and their individual tax statuses. While we can't directly observe this basis

Q3-2015.

distribution, we can estimate it using an approach similar to that of Grinblatt and Han (2005), using the historical price series and average turnover. Denote the current period as t and the market price as P_t. Accounting only for stochastic liquidation—rather than tax-motivated sales—the fraction of shareholders with basis equal to the market price at period $t-n$ is:

$$W(n) = \frac{\omega(1-\omega)^{n-1}}{\bar{\omega}} \tag{25}$$

where ω is the average fraction of stochastic liquidation each period, and $\bar{\omega}$ is chosen such that the weights defined by $W(n)$ sum to one across all n. The numerator represents the probability that the shares were turned over n periods prior due to stochastic liquidation, and were not traded since that time. Therefore, (25) gives the fraction of shareholders with basis P_{t-n} if the probability of stochastic liquidation is independent of the shareholder basis.

We assume shareholders follow the optimal trading strategy thereby harvesting tax losses and deferring gains. This results in a shareholder having a basis equal to the low price over her holding period.[23] As a result, in addition to stochastic liquidation, the shareholder basis is reset when the share price drops below the current basis. Therefore, the mass of shareholders $W(n)$ has a basis equal to the minimum share price since the purchase at time $t-n$:

$$B_{t-n} \equiv \min\{P_{t-n}, ..., P_t\}. \tag{26}$$

For a given inversion, the mean private return for taxable shareholders is then given by:

$$\sum_{n=1}^{\infty} W(n) r^I(B_{t-n}/P_t) \tag{27}$$

where $r^I(B/P)$ is the private return to the investor for a given basis-to-price ratio, defined in Section 3.1.3. We operationalize this estimate by using up to the past 15 years of monthly data.[24] The calibration described in the previous section finds stochastic liquidation to be 7.5% at an annualized rate. We use this value for ω.

In addition to this average shareholder basis measure, we also construct the 3-, 7-, and 15-year low price as estimates of the shareholder bases, as well as the CEO's personal basis.

[23] We abstract from wash sale rules, which complicate this strategy.

[24] We require at least two years of available price data.

Shareholder's private return to inversion

With our measures of shareholder basis from the data, and baseline parameter values from Table II, we use the model to compute the shareholder's private return to an inversion as defined in Section 3.1.3. The shareholder's private return differs from the market return because the shareholder loses her tax-timing option embedded in shares that have increased in value over the holding period.

Figure 4 plots the distribution of private returns to taxable shareholders across the sample of completed and pending inversions. For each inverting firm in the sample, the distribution of shareholder bases is estimated using the approach described in the previous section. The private return of each shareholder (r^I) in this basis distribution is computed in the model. This gives a distribution of private returns for each inversion. The figure plots the smoothed distribution of these private returns across all the inversions in the sample, with each inversion given equal weight. The private returns are computed using the benchmark parameters, with a post-inversion corporate tax rate (τ_c^I) of 20.7% and an individual capital gains tax rate (τ_g^j) of 25.3%.

We see that there is significant heterogeneity across the private returns for taxable shareholders. This heterogeneity is driven by the different bases of shareholders across and within each inverting firm. For example, greater price appreciation prior to the inversion means a higher capital gains tax cost and lower return. The figure shows that a large mass of shareholders are hurt by the inversion, with negative private returns. There are also many taxable shareholders with a positive net benefit to inversion, as shown in the mass to the right of zero. For these shareholders, the capital gains tax cost imposed by the inversion is less than the benefit of reduced corporate taxes.

Panel A of Table III reports the mean, median, and tenth percentile return across the sample of completed and pending inversions for various measures of the shareholder basis and tax rate. The first three rows of Panel A report the private return statistics for the taxable shareholder across the sample of inversions, given the benchmark reduction in the corporate income tax rate following inversion (τ_c^I). Column (1) reports the model-implied market return from the inversion announcement, which does not depend on a basis. In columns (2)–(4) we report statistics on the mean private return defined in Equation (27) for three different individual capital gains tax rates τ_g^j. Column (2) corresponds to a capital gains tax rate of 15% at the federal level, plus a 5.3% state tax rate ($\tau_g^j = 20.3\%$), the median across the 50 states.[25] Column (3) assumes a 20% federal rate

[25]See Pomerleau (2015).

($\tau_g^j = 25.3\%$), and column (4) uses the top marginal rate for California residents ($\tau_g^j = 33\%$). While the market return from inversion is 4.92%, we see that the mean return for taxable shareholders is negative across all three tax groups. For the benchmark rate of 25.3%, taxable shareholders lost on average 1.93% of value from the inversion, as the loss of the tax-timing option outweighs the gain from corporate tax savings. At the 10th percentile of inversions, the average shareholder lost over 4% of value.

We also report the private returns from inversion for shareholders with holding periods of 3, 7, and 15 years, shown in columns (5)–(7). Consistent with the model, we assume an investor immediately recognizes any capital losses and therefore use the low price over these windows as the basis and assume the benchmark capital gains tax rate τ_g^j of 25.3%. As with the average shareholder, these private returns are, on average, negative. For example, the average private return for a shareholder with a 7-year holding period is -3.58%. At the 10th percentile of inversions, these investors lose over 7% of their share value in an inversion.

The final column of Panel A reports the private return statistics for a particularly tax-disadvantaged investor: a 78-year old California resident who had planned to bequest their shares at death and is in the top marginal tax bracket ($\tau_g^j = 33\%$) with a basis equal to the 15-year low price.[26] This investor, in all but one of the inversions in our sample, is hurt by the decision to invert. On average, this investor loses 20.61% of the value of her holdings in an inversion. For this set of long-term and older investors, inversions are highly undesirable and can destroy significant wealth.

The bottom three rows of Panel A report the same private return statistics under the assumptions of aggressive corporate income tax savings following inversion. While this implies a counter-factually large market announcement return of 7.38%, it is illustrative to see that even if the corporate tax savings are large, many shareholders are still hurt by the inversion. Notably, the mean returns to a shareholder at the benchmark capital gains tax rate (column (3)) have an average return of about zero.

Minimum holding period resulting in a negative private return

The private returns to shareholders depend significantly on their bases. Generally, longer holding periods result in a lower basis-to-price ratio and lower private return. Figure 5 plots the private

[26]The age corresponds to a liquidation (in this case death) arrival intensity of 0.1 given by the Social Security Administrations Mortality Table, with a capital gains tax rate upon death of 0%.

return as a function of the holding period and personal capital gains tax rate, with a basis-to-price ratio equal to the mean across all completed and pending inversions. For each inversion, the basis is assumed to be the low price over the holding period, as would be the result of an optimal tax loss harvesting strategy, consistent with the model. The dotted line reports the model-implied market return from the inversion.

We see that for investors residing in California at the top capital gains tax rate of 33% the private returns are on average negative for even relatively short holding periods. Even at lower tax rates, the returns become negative after only moderate holding periods. This reflects the fact that inverting firms often experience significant price appreciation prior to inversion, resulting in a higher capital gains tax burden for their taxable shareholders.

In Panel B of Table III we quantify the minimum holding period that would result in a negative private return for the investor. Specifically, for each inversion in our sample we find the minimum number of years for which a basis of the low price over that period would result in a negative private return for the shareholder. We report the quartiles for these holding periods in years for various types of investors and for different post-inversion tax rates.[27] Roughly, these values can be thought of as the "break even" holding period. We use up to 15 years of price data prior to the inversion announcement and require at least 7 years of data for the firm to be included in the sample.

Columns (1)–(3) report the holding period for investors with different individual capital gains tax rates (τ_g^j). We find that our benchmark investor, shown in column (2), who held shares for only 2.92 years prior to the announcement of the inversion, would have negative returns in half of the sample. At a 1.92 year horizon, 25% of inversions resulted in a negative return for this benchmark investor. This shows that a taxable shareholder does not need a particularly long holding period for an inversion to result in a negative private return.

Finally, column (4) reports the minimum holding period for a 78-year old California resident who does not plan to sell the shares before death and is in the top marginal tax bracket ($\tau_g^j = 33\%$). For this investor, a holding period of only 14 months results in a negative return in half of the observed inversions.

The last three rows of Panel B report the minimum holding periods for a much larger drop in

[27]Note we do not report the mean because for some inversions and capital gains tax rates, the return is positive at all horizons, i.e. these values are undefined. These cases are treated as $+\infty$ for quartile calculations. In the case these values occur on a quartile, they are indicated as "15+".

the post-inversion tax rate. Even in this case, the benchmark taxable shareholder (column (2)) would have a negative private return in half of all inversions if the shares were held for 5.5 years. Overall, the table shows that even some short and medium-term investors are made worse off by an inversion.

3.5 Aggregate Costs and Benefits

In the previous section we saw that private returns vary significantly across taxable shareholders as well as across inversion transactions. Variation in shareholder basis, tax rate, and age drive this heterogeneity in private returns. In this section, we estimate the aggregate corporate tax benefits and personal tax costs across all shareholders, taxable and nontaxable. As a significant fraction of shares are held by foreign investors and within retirement, pension, and other tax-exempt accounts, the aggregate value of inversion will differ significantly from the returns to taxable shareholders explored in the previous section.

We report the aggregated costs and benefits to shareholders in Panel A of Table IV. Column (1) reports the model estimates for the present value of corporate tax savings. The dollar value of these savings is estimated as the market return $(p^I(x)/p(x) - 1)$ times the market capitalization. In aggregate, firms reduced the present value of their corporate tax liabilities by between \$16.9 and \$25.3 billion by inverting, corresponding to the benchmark and aggressive assumptions for tax savings, respectively. This corresponds to the 4.92% and 7.38% market returns implied by the model.

The private return to a shareholder is lower than the market return due to the personal tax cost of inversion. We measure the private return to all shareholders as a weighted sum of the private return to the taxable shareholder and the nontaxable shareholder, where the latter is simply the market return. We estimate the fraction of taxable shareholders at the firm-level using institutional holdings data. We take total institutional ownership and subtract pensions, endowments, and government holdings, which are all nontaxable. We remove foreign institutional ownership by multiplying this remaining fraction by the ratio of U.S. to total institutional ownership. We assume that 42% of this U.S. institutional ownership is in taxable accounts, consistent with the fraction of mutual fund holdings in taxable accounts, as reported by Investment Company Institute (2015). We assume that non-institutional ownership, which makes up only about 14% of ownership in our

inversion sample, is taxable, and that taxable investors face the benchmark capital gains tax rate of 25.3%. Finally, when institutional ownership data is unavailable in our dataset, we use the median fraction of taxable ownership in the inversion sample. The mean (median) fraction of taxable ownership for inverting firms is 28% (27%).

Column (2) reports the private return to all shareholders. Shareholders, in aggregate, capture between $10.2 and $18.2 billion dollars of the corporate tax savings shown in column (1). The aggregate cost of the capital gains event is the difference between columns (1) and (2), and is reported in column (3). The loss of the tax-timing option is valued at between $6.6 and $7.0 billion, representing between 1.9 and 2.1% of total shareholder value. From the government's perspective, this capital gains tax significantly offsets the loss in future corporate tax revenue by between 28 and 39%, shown in column (4).

In contrast to Table III, which reports private returns to taxable shareholders, we see that the average net returns to all shareholders is positive. This is because a significant fraction of shareholders are not subject to U.S. taxation, either because they are held by non-U.S. persons or are held in tax-exempt accounts, for example retirement and pension plans. Subjecting inversions to capital gains tax doesn't appear to make inversions a bad deal for shareholders in aggregate, but it does harm a significant subset of taxable investors. Put differently, an inversion results in a wealth transfer between shareholders.

Panel B of Table IV reports the percent of shareholders with negative model-implied private returns from inversion. We report both value- and equal-weighted measures across our sample of inversions. The first column shows the percent of U.S.-taxable shareholders with negative private returns, and the second reports this percent across all shareholders, both taxable and nontaxable. We see that in the value-weighted case, between 43.7 and 70.0% of taxable shareholders have a negative private return from inversion. However, when we consider taxable and nontaxable shareholders, the percent of shareholders made worse off by an inversion is significantly lower, between 12.1 and 19.5%. Thus, while a majority capture a net benefit, a significant fraction of shareholders suffer a net loss from an inversion.

4 The Incentive to Invert

In the previous section, we saw that the benefits of inversion vary substantially across shareholders depending on their holding period and tax status. In this section, we ask whether the personal tax implications of inversion affect the decision to invert. To answer this question, we first use the model to quantify the CEO's private benefits to inverting based on her stock and option holdings. Next, we test whether the model-estimated shareholder capital gains taxes and CEO private return are able to empirically predict inversions in the data.

4.1 Effect on CEO wealth

In order to understand a CEO's private incentive to undergo an inversion, we use the model to estimate the change in their wealth resulting from the transaction. For most CEOs, a significant portion of their wealth comes from equity-based compensation, specifically stock and options. The stock portion of holdings will increase in value due to the corporate tax savings from the inversion, but this benefit will be offset by the triggering of a capital gains tax event that eliminates the CEO's tax-timing option. Thus, the private value of the CEO's stock holdings are similar to that of any other shareholder, and the net benefit will depend on their personal tax basis.

In contrast, distinct features of option compensation cause the private value of the CEO's option holdings to respond to inversion differently from stock. First, an increase in the share price will increase the value of these options, a basic delta effect. Second, unlike stock holdings, an inversion does not trigger a capital gains tax event on unexercised option holdings. Given that option holdings capture the increased value of the post-inversion firm without incurring any tax-timing cost, option holdings may have a personal tax advantage relative to stock.

Table V reports the model-implied change in the CEO's wealth resulting from an inversion. The sample includes CEOs of firms of completed and pending inversions. The model-implied market return ($p^I(x)/p(x) - 1$) is given in column (1). Column (2) reports the CEO's private return on equity holdings based on her own basis-to-price ratio. This private return on equity holdings, $r^I(B/p; \tau_g^j)$, is computed from the model as described in Section 3.1.3. We construct the capital gains tax basis for each individual CEO using information on her compensation provided in SEC filings and the Execucomp dataset; details are given in Appendix B.2. Consistent with our benchmark calibration, we assume the CEO faces a capital gains tax rate (τ_g^j) of 25.3%.

We report the CEO's total personal return to an inversion, coming from both her stock and option holdings, in column (3). The return on options is estimated as the delta on option holdings (δ) times the model-implied market return: $\delta(p^I(x)/p(x) - 1)$.[28] The CEO's total return is constructed as the value-weighted sum of the CEO's private return on equity and option holdings. The last two columns of the table report, for reference, the model-implied private return for taxable shareholders and all shareholders, as in Tables III and IV, respectively.[29] We report all values for both the benchmark and aggressive assumptions for the post-inversion tax rate (τ_c^I).

We see that the CEO's after-tax private return on equity holdings, shown in column (2), is significantly larger than the inversion returns of taxable shareholders shown in column (4). This is because the CEO's basis tends to reasonably high, given short CEO tenure and frequent stock grants. At the same time, the equity component to the CEO's return is slightly lower than the average across all shareholders reported in column (5). This results from the fact that the CEO still has a capital gains tax liability upon inversion, whereas the set of tax-exempt shareholders do not.

The CEO's total return to an inversion, reported in column (3), is comparable to that of the average shareholder. However, this return differs from that of shareholders in two important respects. First, the variance in total returns to the CEO is far less than that of the average shareholder, with the CEO at the 10th percentile still earning a 2.63% return while the average shareholder has a return of only 0.80%. Second, once option compensation is accounted for, the CEO's total return to an inversion is significantly higher than that of the average taxable shareholder.

There is one additional tax consideration for CEOs completing an inversion. As part of the American Jobs Creation Act of 2004, Congress added section 4985 to the tax code, which imposes a 15% excise tax on unvested stock and unexercised option compensation for officers and directors that occur within the 12 month window surrounding an inversion. However, given that it is commonplace for the firm to reimburse officers for the excise tax imposed on these awards, we do not include these costs in the above analysis.[30]

[28]Due to limited data on the characteristics of option holdings, we estimate the delta for an at-the-money option maturing in 3 years given the benchmark parameters of the model using Black and Scholes (1973).

[29]Note that these values differ slightly from Tables III and IV because we restrict the sample to firms with sufficient CEO compensation data.

[30]While Gupta (2014) states that "grossing up the section 4985 excise tax appears to be the norm in inversion transactions," the cost of reimbursement can be quite large. In the highly publicized example of

Overall, the CEO's private return is positive and does not appear to differ substantially from that of the average shareholder. At the same time, the CEO does not appear to have incentives in line with the many taxable shareholders who are made worse off by the inversion.

4.2 Personal tax costs and the decision to invert

We now test whether the personal tax costs of inversion, for both shareholders and the CEO, affect the decision to invert. Table VI presents a logistic regression of a firm's decision to invert on its characteristics and the personal tax costs to shareholders and the CEO. The dependent variable takes a value of 1 in the last fiscal year prior to the announcement of an inversion, and 0 otherwise. Basic firm characteristics—log of book assets, market to book ratio, cash to assets, profitability—are included as controls. All specifications also control for a time trend in inversion activity, motivated by the empirical pattern seen in Figure 1. In addition, the foreign share of tax, defined as foreign taxes paid divided by total taxes paid, is included as a proxy for the extent to which income is derived from foreign sources.[31]

The benchmark logit estimate is shown in column (1) of Table VI. The log of assets, market-to-book ratio, and foreign share of taxes are positive and significant, while the other variables do not show significance. Interestingly, we do not find evidence that firms with large cash holdings are more likely to invert, as the coefficient on the cash-to-asset ratio is negative and insignificant.

We next test whether the aggregate capital gains cost to shareholders predicts inversion activity. This is shown in column (2), where the aggregate cost of personal taxes is estimated for the distribution of shareholder bases. Specifically, the aggregate cost is measured as the average capital gains cost for taxable shareholders times the fraction of shareholders that are taxable. The average capital gains cost is given by the model-implied market return from inversion $(p^I(x)/p(x) - 1)$ minus the average private return from inversion given by Equation (27) and reported in Table III. The fraction of shares held in taxable accounts is estimated using institutional ownership data. See Section 3.4 for details.

Medtronic in 2014, payouts totalled $63 million to cover an excise tax bill of $23.25 million for its covered officers and directors, as gross ups are themselves taxable income. In our own analysis, we find strong evidence of a gross up. Specifically, in the year following an inversion, we find that the CEO receives "Other Compensation" that is $3.26 million higher than the average. We do not see a similar increase for the CEOs of non-inverting acquirers.

[31] Foreign share of earnings is not used because this value is less frequently reported than foreign taxes paid.

The coefficient on the average capital gains cost to shareholders, shown in column (2), is negative and significant, revealing that firms for which shareholders have high unrealized capital gains are less likely to invert. Column (3) shows the effect disaggregated into the average capital gains cost for taxable shareholders and the fraction of shares held in taxable accounts. The results indicate that the taxable fraction of shareholders is a strong predictor of inversion. There are two common interpretations of this result in the tax clientele literature. One is that management caters to the personal tax consequences of their shareholders and therefore is less likely to push for an inversion when a high percentage of the ownership is taxable. Another possibility is that tax-advantaged shareholders self-select into the ownership of firms that are more likely to invert. These effects are not mutually exclusive and the tax clientele literature has found these effects to be concurrently important in other, related contexts (see Desai and Jin (2011)). Under either of these interpretations, our empirical results suggest a tax clientele effect in the decision to invert.

We next explore how the CEO's incentives predict the inversion decision. Column (4) of Table VI includes the CEO's personal capital gains cost in an inversion. This cost depends on the CEO's personal tax basis and is defined as the model-implied market return $(p^I(x)/p(x) - 1)$ minus the private return to the CEO as computed from the model; see Section 4.1 for details. The coefficient estimate has a negative sign, but is not statistically significant. However, this measure does not account for the effect of the CEO's option holdings. Column (5) includes a measure of the after-tax total private return to the CEO, from both equity and option compensation, as defined in Section 4.1. This coefficient is positive and significant, indicating that CEOs with a higher personal gain from inversion are more likely to invert. Finally, column (6) includes both the aggregate shareholder costs and the CEO's private return. The CEO's private incentive remains significant.

Overall, we find strong evidence that personal tax consequences of inversion predict the decision to invert. Firms with a low fraction of U.S.-taxable ownership—which results in part from high foreign institutional ownership—are more likely to invert. In addition to this tax clientele effect, we find evidence that the personal tax consequences to the CEO help to predict inversion. This appears to be driven in part by the composition of stock and option compensation, with option compensation encouraging inversion. The existing literature has shown that the mix of stock and option compensation has important effects on a CEO's preference towards risk, investment policy, and response to uncertainty shocks (e.g., Panousi and Papanikolaou (2012), Glover and Levine

(2014), and Glover and Levine (2015)). In addition, the use of option compensation has been shown to affect the level and composition of corporate payout (e.g., Lambert, Lanen, and Larcker (1989) and Fenn and Liang (2001)). Our results provide evidence of an unexplored channel through which the mix of compensation can affect corporate policy: the CEO's personal tax consequences differ across stock and option holdings, influencing their choice of corporate policies.

5 Conclusion

We show that corporate inversions have substantially varied private returns across individual shareholders, even within the same firm, due to the personal tax consequences of these transactions. U.S. shareholders must realize a capital gain at the time of inversion, forcing them to forfeit their tax-timing option. This personal tax cost is often high for long-term investors who purchased their shares at a low price, while the penalty for short-term, foreign, and tax-exempt investors is small or nonexistent. The differential effect on shareholders brings into question the efficacy and fairness of this tax penalty imposed by the U.S. Treasury to discourage expatriation of U.S. companies. Furthermore, we show that these personal tax costs significantly offset the government's loss in tax revenue resulting from an inversion.

The personal tax consequences of inversion highlight a unique agency conflict between different blocks of shareholders as well as management. In most cases, an inversion is detrimental to certain parties, even when the aggregate returns to shareholders are positive. We find that the personal tax situation of the CEO predicts the decision to invert. We also find that firms with a high percent of nontaxable shareholders are more likely to invert, suggesting a tax clientele effect. Given that inversion results in a wealth transfer between shareholders, this brings to light an usual governance situation in which certain groups of investors may rationally oppose corporate policy that maximizes aggregate shareholder value.

References

Allen, Franklin, Antonio E Bernardo, and Ivo Welch, 2000, A theory of dividends based on tax clienteles, *The Journal of Finance* 55, 2499–2536.

Bae, Kee-Hong, Jun-Koo Kang, and Jin-Mo Kim, 2002, Tunneling or value added? evidence from mergers by korean business groups, *The Journal of Finance* 57, 2695–2740.

Bennedsen, Morten, and Stefan Zeume, 2015, Corporate tax havens and shareholder value, *Available at SSRN 2586318*.

Bird, Andrew, Alexander Edwards, and Terry J Shevlin, 2015, Does the us system of taxation on multinationals advantage foreign acquirers?, *Available at SSRN 2550819*.

Bird, Andrew, and Stephen A Karolyi, 2015, Governance and taxes: Evidence from regression discontinuity, *Available at SSRN 2572683*.

Black, Fischer, and Myron Scholes, 1973, The pricing of options and corporate liabilities, *The Journal of Political Economy* pp. 637–654.

Cheung, Yan-Leung, P Raghavendra Rau, and Aris Stouraitis, 2006, Tunneling, propping, and expropriation: evidence from connected party transactions in hong kong, *Journal of Financial Economics* 82, 343–386.

Claessens, Stijn, Simeon Djankov, Joseph PH Fan, and Larry HP Lang, 2002, Disentangling the incentive and entrenchment effects of large shareholdings, *The Journal of Finance* 57, 2741–2771.

Clausing, Kimberly A, 2015, The effect of profit shifting on the corporate tax base in the united states and beyond, *Available at SSRN 2685442*.

Cloyd, C Bryan, Lillian F Mills, and Connie D Weaver, 2003, Firm valuation effects of the expatriation of us corporations to tax-haven countries, *Journal of the American Taxation Association* 25, 87–109.

Constantinides, George M, 1983, Capital market equilibrium with personal tax, *Econometrica: Journal of the Econometric Society* pp. 611–636.

——— , 1984, Optimal stock trading with personal taxes: Implications for prices and the abnormal january returns, *Journal of Financial Economics* 13, 65–89.

Dammon, Robert M, Kenneth B Dunn, and Chester S Spatt, 1989, A reexamination of the value of tax options, *Review of Financial Studies* 2, 341–372.

Dammon, Robert M, and Chester S Spatt, 2012, Taxes and investment choice, *Annu. Rev. Financ. Econ.* 4, 411–429.

——— , and Harold H Zhang, 2001, Optimal consumption and investment with capital gains taxes, *Review of Financial Studies* 14, 583–616.

Desai, Mihir A, and Dhammika Dharmapala, 2006, Corporate tax avoidance and high-powered incentives, *Journal of Financial Economics* 79, 145–179.

Desai, Mihir A, and James R Hines, 2002, Expectations and expatriations: Tracing the causes and consequences of corporate inversions, *National Tax Journal* 55, 409–40.

Desai, Mihir A, and Li Jin, 2011, Institutional tax clienteles and payout policy, *Journal of Financial Economics* 100, 68–84.

Dixit, Avinash K, and Robert S Pindyck, 1994, *Investment under uncertainty* (Princeton University Press).

Edwards, Alexander, Todd Kravet, and Ryan Wilson, 2015, Trapped cash and the profitability of foreign acquisitions, *Contemporary Accounting Research*.

Faulkender, Michael W, Kristine W Hankins, and Mitchell A Petersen, 2015, Understanding precautionary cash at home and abroad, .

Fenn, George W, and Nellie Liang, 2001, Corporate payout policy and managerial stock incentives, *Journal of Financial Economics* 60, 45–72.

Ferreira, Miguel A, Massimo Massa, and Pedro Matos, 2010, Shareholders at the gate? institutional investors and cross-border mergers and acquisitions, *Review of Financial Studies* 23, 601–644.

Foley, C Fritz, Jay C Hartzell, Sheridan Titman, and Garry Twite, 2007, Why do firms hold so much cash? a tax-based explanation, *Journal of Financial Economics* 86, 579–607.

Glover, Brent, and Oliver Levine, 2014, Idiosyncratic risk and the manager, *Available at SSRN 2024384*.

——— , 2015, Uncertainty, investment, and managerial incentives, *Journal of Monetary Economics* 69, 121–137.

Graham, John R, 1999, Do personal taxes affect corporate financing decisions?, *Journal of Public Economics* 73, 147–185.

——— , 2003, Taxes and corporate finance: A review, *Review of Financial studies* 16, 1075–1129.

Green, Richard C, and Burton Hollifield, 2003, The personal-tax advantages of equity, *Journal of Financial Economics* 67, 175–216.

Grinblatt, Mark, and Bing Han, 2005, Prospect theory, mental accounting, and momentum, *Journal of Financial Economics* 78, 311–339.

Gupta, Ajay, 2014, News analysis: Grossing up an inversion tax, *Tax Analysts* [`http://www.taxanalysts.com/www/features.nsf/Features/75722BEE3E877D1685257D4F00603223?OpenDocument`; Accessed 22-Feb-2016].

Hanlon, Michelle, Rebecca Lester, and Rodrigo Verdi, 2015, The effect of repatriation tax costs on us multinational investment, *Journal of Financial Economics* 116, 179–196.

Harford, Jarrad, Dirk Jenter, and Kai Li, 2011, Institutional cross-holdings and their effect on acquisition decisions, *Journal of Financial Economics* 99, 27–39.

Herzfeld, Mindy, 2014, News analysis: What's next in inversion land?, *Tax Analysts* [`http://www.taxanalysts.com/www/features.nsf/Features/F817995A255AFD2485257CF900427B06?OpenDocument`; Accessed 16-Feb-2016].

Investment Company Institute, 2015, Investment company fact book, .

Jiang, Guohua, Charles MC Lee, and Heng Yue, 2010, Tunneling through intercorporate loans: The china experience, *Journal of Financial Economics* 98, 1–20.

Lambert, Richard A, William N Lanen, and David F Larcker, 1989, Executive stock option plans and corporate dividend policy, *Journal of Financial and Quantitative Analysis* 24, 409–425.

Leland, Hayne E, 1994, Corporate debt value, bond covenants, and optimal capital structure, *The Journal of Finance* pp. 1213–1252.

Lie, Erik, and Heidi J Lie, 1999, The role of personal taxes in corporate decisions: An empirical analysis of share repurchases and dividends, *Journal of Financial and Quantitative Analysis* 34, 533–552.

Lin, Leming, and Mark J Flannery, 2013, Do personal taxes affect capital structure? evidence from the 2003 tax cut, *Journal of Financial Economics* 109, 549–565.

Matvos, Gregor, and Michael Ostrovsky, 2008, Cross-ownership, returns, and voting in mergers, *Journal of Financial Economics* 89, 391–403.

Morellec, Erwan, and Norman Schürhoff, 2010, Dynamic investment and financing under personal taxation, *Review of Financial Studies* 23, 101–146.

Panousi, Vasia, and Dimitris Papanikolaou, 2012, Investment, idiosyncratic risk, and ownership, *The Journal of Finance* 67, 1113–1148.

Pomerleau, Kyle, 2015, The high burden of state and federal capital gains tax rates in the united states, *Tax Foundation*.

Seida, Jim A, and William F Wempe, 2003, Investors' and managers' reactions to corporate inversion transactions, *Available at SSRN 359820*.

Strebulaev, Ilya A, and Toni M Whited, 2011, Dynamic models and structural estimation in corporate finance, *Foundations and Trends in Finance* 6.

U.S. Treasury, 2016, Taxes paid on long-term capital gains, 1977-2013, [`https://www.treasury.gov/resource-center/tax-policy/Documents/OTAR-Taxes-Paid-on-Long-Term-Capital-Gains-1977-2013.pdf`; Accessed 12-Apr-2016].

VanderWolk, Jefferson P, 2010, Inversions under section 7874 of the internal revenue code: Flawed legislation, flawed guidance, *Northwestern Journal of International Law & Business* 30, 699.

Zechner, Josef, 1990, Tax clienteles and optimal capital structure under uncertainty, *Journal of Business* pp. 465–491.

Appendices

A Model Solution

In this appendix we derive the investor's private valuation and market price for the pre-inversion firm, providing a proof to Propositions 1 and 2.

A.1 Post-inversion valuation

We start by deriving an investor's private valuation and the market price of the post-inversion firm. In the next section, we derive the pre-inversion valuations, which depend on these post-inversion values.

A.1.1 Post-inversion private valuation: $v^I(x;B)$

For an investor with basis B, their private valuation of the post-inversion firm, $v^I(x;B)$, satisfies the following ordinary differential equation:

$$\frac{\sigma^2}{2}x^2 v^I_{xx}(x;B)+\mu x v^I_x(x;B)+\xi[(1-\tilde{\tau}_g)p^I(x)+\tilde{\tau}_g B-v^I(x;B)]+(1-\tau_d)(1-\tau^I_c)x = rv^I(x;B). \quad (28)$$

At any time, an investor with basis B could sell her share at the current market price, $p^I(x)$, and receive after-tax proceeds of

$$(1-\tau_g)p^I(x)+\tau_g B. \quad (29)$$

This implies that the ODE in Equation (28) is subject to the following boundary conditions:

$$v^I(x) = (1-\tau_g)p^I(x)+\tau_g B \qquad \text{for } x = x_B \quad (30)$$

$$v^I_x(x) = (1-\tau_g)p^I_x(x) \qquad \text{for } x = x_B. \quad (31)$$

Equations (30) and (31) are the value-matching and smooth-pasting conditions, respectively, and x_B denotes the cash flow threshold at which an investor with basis B optimally sells her shares. It is well known that the solution to this ODE will take the general form[32]:

$$v^I(x) = A_0 + A_1 x + A_2 x^{-\gamma_1} \quad (32)$$

[32]See, for example, Dixit and Pindyck (1994).

where γ_1, the positive root of the fundamental quadratic, is given by

$$\gamma_1 = \frac{1}{2} - \frac{\mu}{\sigma^2} + \sqrt{\left(\frac{\mu}{\sigma^2} - \frac{1}{2}\right)^2 + \frac{2(r+\xi)}{\sigma^2}}. \tag{33}$$

Solving for the A coefficients, we get an explicit expression for the investor's private valuation of a post-inversion firm,

$$v^I(x;B) = \left(\frac{x}{x_B}\right)^{-\gamma_1} \left(p^I(x_B) - h(x_B;B)\right) + h(x;B), \tag{34}$$

where the function $h(x;B)$ is defined as

$$h(x;B) = \frac{(1-\tau_d)(1-\tau_c^I)x}{r+\xi-\mu} + \frac{\xi(1-\tilde{\tau}_g)p^I(x)}{r+\xi-\mu} + \frac{\xi\tilde{\tau}_g B}{r+\xi}. \tag{35}$$

A.1.2 Post-inversion market price: $p^I(x)$

Next, we derive the market price. Implicitly, the market price is characterized by the fixed point:

$$p^I(x) = v^I(x;p^I(x)). \tag{36}$$

Start with the smooth pasting condition that characterizes an investor's optimal selling threshold, given by equation (31). This gives

$$\frac{\partial p^I(x)}{\partial x} = \left(\frac{1}{1-\tau_g}\right) \frac{\partial v^I(x;B)}{\partial x}. \tag{37}$$

This must hold for any B, including $B = p^I(x)$. Thus, we can write

$$\frac{\partial p^I(x)}{\partial x} = \left(\frac{1}{1-\tau_g}\right) \left.\frac{\partial v^I(x;B)}{\partial x}\right|_{B=p^I(x)}. \tag{38}$$

Taking the partial derivative of the expression we have for the investor's private valuation, given in Equation (34), evaluating this at $B = p^I(x)$ (which implies $x_B = x$), plugging this into the equation above, and rearranging, we have the following ODE characterizing the post-inversion market price:

$$\begin{aligned} &\frac{\partial p^I(x)}{\partial x}x + \frac{\gamma_1}{1-\tau_g}\left(p^I(x)\left[1 - \frac{\xi(1-\tilde{\tau}_g)}{r+\xi-\mu} - \frac{\xi\tilde{\tau}_g}{r+\xi}\right] - \frac{(1-\tau_d)(1-\tau_c^I)x}{r+\xi-\mu}\right) \\ &- \frac{x}{1-\tau_g}\left(\frac{(1-\tau_d)(1-\tau_c^I)}{r+\xi-\mu} + \frac{\xi(1-\tilde{\tau}_g)}{r+\xi-\mu}\cdot\frac{\partial p^I(x)}{\partial x}\right) = 0 \end{aligned} \tag{39}$$

Define

$$\eta^I = \frac{(1-\tau_d)(1-\tau_c^I)}{r+\xi-\mu} \qquad \text{and} \qquad \omega^I = \frac{\xi(1-\tilde{\tau}_g)}{r+\xi-\mu}. \tag{40}$$

Rearranging the above ODE, we have

$$\left(1-\frac{\omega^I}{1-\tau_g}\right)\frac{\partial p^I(x)}{\partial x}x+\frac{\gamma_1}{1-\tau_g}\left(1-\omega^I-\frac{\xi\tilde{\tau}_g}{r+\xi}\right)p^I(x)-\frac{(1+\gamma_1)\eta^I}{1-\tau_g}x=0. \tag{41}$$

The solution to this ODE has the general form $p^I(x)=A^I(x)$. Solving explicitly for $p^I(x)$, we have

$$p^I(x)=\left(\frac{(1+\gamma_1)\eta^I}{(1+\gamma_1)(1-\omega^I)-\tau_g-\frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}}\right)x. \tag{42}$$

Finally, we explicitly characterize the investor's selling threshold, x_B, in terms of their basis B. As noted earlier, for an investor with basis B, the optimal selling threshold for the cash flow level, x_B, is implicitly defined by

$$p^I(x_B)=B. \tag{43}$$

Given the expression for the market price provided in Equation (58), we have

$$x_B=\left(\frac{(1+\gamma_1)(1-\omega^I)-\tau_g-\frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}}{(1+\gamma_1)\eta^I}\right)B. \tag{44}$$

A.2 Pre-inversion valuation and market price

We now derive the private valuation and market price for a firm that has not yet inverted. The approach to solving for these valuations is the same as in the case of the post-inversion firm of the previous section.

A.2.1 Private valuation of the pre-inversion firm: $v(x;B)$

For an individual investor with basis B, their private valuation of the pre-inversion firm, $v(x;B)$, satisfies the following ordinary differential equation:

$$\begin{aligned}&\frac{\sigma^2}{2}x^2v_{xx}(x;B)+\mu xv_x(x;B)+\xi[(1-\tilde{\tau}_g)p(x)+\tilde{\tau}_gB-v(x;B)]\\&+\lambda[(1-\tau_g)p^I(x)+\tau_gB-v]+(1-\tau_d)(1-\tau_c)x=rv(x;B),\end{aligned} \tag{45}$$

where $p^I(x)$ denotes the market price of the post-inversion firm with cash flow level x.

As with the post-inversion firm, at any time, an investor with basis B could sell her share at the current pre-inversion market price, $p(x)$, and receive after-tax proceeds of

$$(1-\tau_g)p(x)+\tau_gB. \tag{46}$$

This implies that the ODE in Equation (45) is subject to the following boundary conditions:

$$v(x) = (1-\tau_g)p(x) + \tau_g B \qquad \text{for } x = x_B \tag{47}$$

$$v_x(x) = (1-\tau_g)p_x(x) \qquad \text{for } x = x_B. \tag{48}$$

As before, Equations (47) and (48) are the value-matching and smooth-pasting conditions, respectively, and x_B denotes the cash flow threshold at which an investor with basis B optimally sells her shares. As before, the solution to this ODE will take the general form:

$$v(x) = A_0 + A_1 x + A_2 x^{-\beta_1} \tag{49}$$

where β_1, the positive root of the fundamental quadratic, is given by

$$\beta_1 = \frac{1}{2} - \frac{\mu}{\sigma^2} + \sqrt{\left(\frac{\mu}{\sigma^2} - \frac{1}{2}\right)^2 + \frac{2(r+\xi+\lambda)}{\sigma^2}}. \tag{50}$$

Solving for the A coefficients, we obtain an explicit expression for the private valuation of an investor with basis B, given current cash flow level of x:

$$v(x;B) = \left(\frac{x}{x_B}\right)^{-\beta_1} \Big(p(x_B) - g(x_B;B)\Big) + g(x;B), \tag{51}$$

where the function $g(x;B)$ is defined as

$$g(x;B) = \frac{(1-\tau_d)(1-\tau_c)x + \xi(1-\tilde{\tau}_g)p(x) + \lambda(1-\tau_g)p^I(x)}{r+\xi+\lambda-\mu} + \frac{(\xi\tilde{\tau}_g + \lambda\tau_g)B}{r+\xi+\lambda}. \tag{52}$$

A.2.2 Pre-inversion market price: $p(x)$

We now proceed to derive an explicit expression for the market price of the pre-inversion firm. The approach follows the derivation of the price for the post-inversion firm. Recall that the pre-inversion market price is characterized by the fixed point:

$$p(x) = v(x; p(x)). \tag{53}$$

We follow the same approach as before, starting with the smooth pasting condition that characterizes an investor's optimal selling threshold, given by equation (15). This says

$$\frac{\partial p(x)}{\partial x} = \left(\frac{1}{1-\tau_g}\right) \frac{\partial v(x;B)}{\partial x}. \tag{54}$$

This must hold for any B, including $B = p(x)$. Thus, the following must hold:

$$\frac{\partial p(x)}{\partial x} = \left(\frac{1}{1-\tau_g}\right) \frac{\partial v(x;B)}{\partial x}\bigg|_{B=p(x)}. \tag{55}$$

Taking the partial derivative of the expression we have for the investor's private valuation, given in equation (51), evaluating this at $B = p(x)$ (which implies $x_B = x$), plugging this into the equation above, and rearranging, we have the following ODE:

$$\begin{aligned}&\left[1 - \left(\frac{1}{1-\tau_g}\right)\frac{\xi(1-\tilde{\tau}_g)}{r+\xi+\lambda-\mu}\right]\frac{\partial p(x)}{\partial x}x + \left[\frac{\beta_1}{1-\tau_g}\left(1 - \frac{\xi(1-\tilde{\tau}_g)}{r+\xi+\lambda-\mu} - \frac{\xi\tilde{\tau}_g + \lambda\tau_g}{r+\xi+\lambda}\right)\right]p(x) \\ &- \frac{1}{1-\tau_g}\left[(1+\beta_1)\frac{\lambda(1-\tau_g)}{r+\xi+\lambda-\mu}\right]p^I(x) - \frac{1+\beta_1}{1-\tau_g}\left[\frac{(1-\tau_d)(1-\tau_c)}{r+\xi+\lambda-\mu}\right]x = 0\end{aligned} \tag{56}$$

Define

$$\begin{aligned}\eta &= \frac{(1-\tau_d)(1-\tau_c)}{r+\xi+\lambda-\mu}, & \omega &= \frac{\xi(1-\tilde{\tau}_g)}{r+\xi+\lambda-\mu}, \\ \Lambda &= \frac{\lambda(1-\tau_g)}{r+\xi+\lambda-\mu}, & \Theta &= \frac{\xi\tilde{\tau}_g + \lambda\tau_g}{r+\xi+\lambda} \\ A^I &= \frac{(1+\gamma_1)\eta^I}{(1+\gamma_1)(1-\omega^I) - \tau_g - \frac{\gamma_1\xi\tilde{\tau}_g}{r+\xi}}.\end{aligned}$$

Then we can rewrite the above as

$$\left[1 - \frac{\omega}{1-\tau_g}\right]\frac{\partial p(x)}{\partial x}x + \left[\frac{\beta_1(1-\omega-\Theta)}{1-\tau_g}\right]p(x) - \frac{(1+\beta_1)\Lambda}{1-\tau_g}p^I(x) - \frac{(1+\beta_1)\eta}{1-\tau_g}x = 0 \tag{57}$$

Solving this ODE, we have an expression for the market price of the pre-inversion firm:

$$p(x) = \left(\frac{(1+\beta_1)(A^I\Lambda+\eta)}{(1+\beta_1)(1-\omega) - \beta_1\Theta - \tau_g}\right)x. \tag{58}$$

Finally, analogous to the case of the post-inversion firm, the optimal selling threshold, x_B, is given by

$$x_B = \left(\frac{(1+\beta_1)(1-\omega) - \beta_1\Theta - \tau_g}{(1+\beta_1)(A^I\Lambda+\eta)}\right)B. \tag{59}$$

B Data

B.1 Variable definitions

We use the CRSP and Compustat databases to construct the following firm variables:

Firm value	=	market value of common equity (prc * shrout) + short-term debt (dlc) + long-term debt (dltt).
Book leverage	=	(short-term debt (dlc) + long-term debt (dltt)) / book assets (at).
Net leverage	=	(short-term debt (dlc) and long-term debt (dltt) - cash and short-term investments (che)) / book assets (at).
Cash to assets	=	cash and short-term investments (che) / book assets (at).
EBITDA to assets	=	earnings before interest (ebitda) / book assets (at).
Asset tangibility	=	new PPE (ppent) / book assets (at).
M/B	=	(market value of common equity (prc * shrout) + short-term debt (dlc) + long-term debt (dltt) + preferred stock liquidating value (pstkl) - deferred taxes and investment tax credits (txditc)) / book assets (at).
Share of foreign earnings (≥ 0)	=	foreign pretax income (pifo) / pretax income (pi). Only calculated when domestic and foreign incomes are non-negative.
Share of foreign taxes (≥ 0)	=	foreign income taxes (txfo) / current income taxes (txc). Only calculated when domestic and foreign taxes are non-negative.
Share of foreign taxes (normalized)	=	|foreign income taxes (txfo)| / (|domestic income taxes (txdom)| + |foreign income taxes (txfo)|). Absolute value allows inclusion of negative observations, while still measuring the relative magnitude of foreign operations.
CEO options holdings	=	market value of options divided by the sum of the market value of options and shares.
CEO stock tax basis	=	ratio of current share price to the CEO's average cost basis, constructed as defined in Appendix B.2.
Average shareholder basis	=	current share price divided by the capital gains tax basis for the average shareholder, estimated using the approach described in Section 3.4.
Institutional ownership (total)	=	fraction of shares outstanding held by institutions.
Institutional ownership (U.S.)	=	fraction of shares outstanding held by U.S. institutions.
Institutional ownership (foreign)	=	fraction of shares outstanding held by foreign institutions.

B.2 CEO Cost Basis

Data for CEO cost basis computation are taken from Execucomp. Missing data for inverters' CEO compensation are hand collected from SEC filings of either financial reports or proxy statements—

the firm's annual 10-K report or Form DEF 14A.

To calculate cost basis, ideally one would have data on prices and volumes for every event of shares being sold, purchased or acquired through option exercise or restricted stock vesting. Information on options exercised is available in Execucomp for all years, and on vesting shares only since 2006 as required under FAS 123R. Data on all purchases and sales of shares are not readily available, and we therefore approximate these transactions using net purchases, calculated as a change in the number of held shares adjusted for shares obtained through option exercise and vesting.

We assume that CEOs do not hold company shares before being appointed to office. Using the average cost method, cost basis in year t can be calculated recursively as:

$$b_t = \begin{cases} \frac{s_{t-1}b_{t-1}+o_t p_t^o+r_t p_t^r+s_t^p p_t}{s_t} & \text{if } s_t^p \geq 0 \\ \frac{s_{t-1}b_{t-1}+o_t p_t^o+r_t p_t^r}{s_t-s_t^p} & \text{if } s_t^p < 0 \end{cases}$$

where

s_t	=	number shares held at the end of period t.
p_t	=	average share price during year t. All share sales and purchases are assumed to be made at this price.
o_t	=	number of options exercised during period t.
p_t^o	=	share price at the time of option o_t exercise, assumed equal to p_t.
r_t	=	number of (restricted) shares vesting during period t. Assumed to be 0 before 2006.
p_t^r	=	price of restricted shares, r_t, at the time of vesting.
s_t^p	$\equiv$	$s_t - s_{t-1} - o_t - r_t$; net purchase of shares during period t.

Table I: **Summary Statistics**

This table reports summary statistics for the last fiscal year end prior to the announcement of an inversion. These are shown for all inversions and are also split into inversions involving an existing foreign subsidiary (naked) and those effected through a merger. For comparison, the final column reports summary statistics for the CRSP/Compustat universe of U.S. public firms for the period 1993–2015. For each characteristic, we report the mean, the median in brackets, and the standard deviation in parentheses. Variable definitions are provided in Appendix B.

	All inversions	Naked	Merger	All Compustat
log(Market size)	8.367	7.688	8.852	6.107
	[8.466]	[8.167]	[8.749]	[5.990]
	(1.683)	(1.482)	(1.668)	(2.055)
log(Sales)	7.504	6.998	7.852	5.401
	[7.498]	[7.219]	[8.035]	[5.360]
	(1.738)	(1.529)	(1.807)	(2.250)
Gross book leverage	0.269	0.258	0.276	0.217
	[0.259]	[0.240]	[0.271]	[0.162]
	(0.163)	(0.145)	(0.177)	(0.216)
Net book leverage	0.128	0.136	0.123	0.038
	[0.147]	[0.184]	[0.144]	[0.068]
	(0.237)	(0.226)	(0.247)	(0.366)
Cash/Assets	0.140	0.123	0.153	0.180
	[0.085]	[0.067]	[0.129]	[0.077]
	(0.151)	(0.175)	(0.133)	(0.226)
EBITDA/Assets	0.123	0.102	0.137	0.040
	[0.128]	[0.125]	[0.129]	[0.082]
	(0.113)	(0.114)	(0.112)	(0.221)
PPE/Assets	0.268	0.406	0.184	0.224
	[0.179]	[0.383]	[0.109]	[0.136]
	(0.256)	(0.279)	(0.203)	(0.235)
M/B	1.658	1.229	1.928	1.815
	[1.193]	[0.923]	[1.356]	[1.171]
	(1.298)	(1.023)	(1.391)	(1.925)
Foreign / Total earnings (>= 0)	0.311	0.362	0.274	0.314
	[0.247]	[0.211]	[0.280]	[0.243]
	(0.282)	(0.318)	(0.254)	(0.273)
Foreign / Total taxes (>= 0)	0.389	0.398	0.385	0.204
	[0.311]	[0.303]	[0.318]	[0.008]
	(0.348)	(0.344)	(0.355)	(0.313)
Sample size	60	25	35	112,370

Table II: **Benchmark Model Parameters**

This table presents the benchmark parameters used in the model. Where applicable, values are at an annual frequency. The parameter choices and calibration are discussed in Section 3.3.

Description	Parameter	Value
Firm parameters		
Cash flow growth	μ	0.03
Cash flow volatility	σ	0.25
Pre-inversion effective corporate income tax rate	τ_c	0.251
Post-inversion effective corporate income tax rate	τ_c^I	0.207
Inversion arrival intensity	λ	0.01
Marginal investor parameters		
Discount rate	r	0.05
Dividend tax rate	τ_d	0.161
Capital gains tax rate	τ_g	0.161
Capital gains tax rate at liquidation	$\tilde{\tau}_g$	0.088
Investor liquidation intensity	ξ	0.075

Table III: **Model-Implied Private Return from Inversion**

This table presents statistics on the taxable investor's private return (Panel A) and breakeven holding period in years (Panel B) for the sample of observed inversions for various classes of investors, estimated using the shareholder's basis and post-inversion tax rates (τ_c^I). The investor's private return from the inversion is defined in Section 3.1.3. For each inversion in the data, the model-implied private return is calculated. In all cases, the baseline parameters given in Table II are used. Panel A reports the mean, median, and tenth percentile of the percent returns. The model-implied market return from inversion announcement is reported in column (1) and does not vary across firms. Columns (2)–(4) reports statistics for the average shareholder return defined by Equation (27), for three different individual capital gains tax rates (τ_g^j). The 3-, 7-, and 15-year holding period measures, shown in columns (5)–(7), use the low price over that period as the basis and the benchmark capital gains tax rate (τ_g^j) of 25.3%. Finally, column (8) reports return statistics for a 78-year old ($\xi = 0.1$) California resident who does not plan to sell the shares before death, is in the top marginal tax bracket (33%), and has a basis at the 15-year low price. Panel B reports the quartiles of the holding period, in years, for which an investor with the given characteristics would receive a negative private return from inversion. For example, an investor with a 25.3% capital gains tax rate who has held the shares for 2.92 years would receive a negative private return in half of the inversion deals.

Panel A: Shareholder private returns

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Market	Avg. s.h., τ_g^j =			Holding period (low price)			Wealthy
τ_c^I		Return	20.3%	25.3%	33%	3-year	7-year	15-year	CA res.
20.7%	Mean	4.92	-0.20	-1.93	-4.74	-0.72	-3.58	-5.57	-20.61
	Median		-0.28	-2.07	-4.96	-0.86	-3.96	-5.93	-21.56
	10 pctl.		-1.94	-4.22	-7.95	-3.77	-7.09	-8.54	-26.10
17.9%	Mean	7.38	1.93	0.11	-2.85	1.30	-1.50	-3.47	-18.88
	Median		1.86	-0.01	-3.04	1.18	-1.87	-3.81	-19.83
	10 pctl.		0.22	-2.14	-6.01	-1.68	-4.96	-6.39	-24.37

Panel B: Minimum holding period (years) resulting in a negative private return

		(1)	(2)	(3)	(4)
		Avg. s.h., τ_g^j =			Wealthy
τ_c^I		20.3%	25.3%	33%	CA res.
20.7%	Q1	2.92	1.92	1.00	0.50
	Median	5.42	2.92	1.88	1.13
	Q3	9.00	6.67	3.25	2.00
17.9%	Q1	6.08	2.92	1.67	0.67
	Median	11.33	5.50	2.83	1.63
	Q3	15+	9.17	4.17	2.83

Table IV: **Aggregate Costs and Benefits from Inversion**

Panel A reports the model-estimated corporate tax benefits and personal tax costs of inversion in aggregate across all shareholders, taxable and nontaxable. Column (1) reports the model estimates for the present value of corporate tax savings. The dollar value of these savings is estimated as the market return $(p^I(x)/p(x)-1)$ times the market capitalization. The equal- and value-weighted means are the model-implied market returns. Column (2) reports the private return (r^I) to all shareholders, both taxable and nontaxable. We measure the private return to all shareholders as a weighted sum of the private return to the taxable shareholder and the nontaxable shareholder, where the latter is simply the market return. We estimate the fraction of taxable shareholders at the firm-level using the approach described in Section 3.5. Column (3) reports the aggregate cost of the loss of the tax-timing option triggered by inversion and is defined as the difference between corporate tax savings (column (1)) and the private return (column (2)). Column (4) reports the fraction of corporate tax reduction offset by personal tax liability, the ratio of column (3) to column (1). Panel B reports the percent of shareholders with negative model-implied private returns from inversion, using value and equal weighting across inversions. The first columns shows the percent of U.S.-taxable shareholders with negative private returns, and the second reports this percent across all shareholders, taxable and nontaxable. For both panels, the results are shown using the benchmark parameters with an individual capital gains tax rate (τ_g^j) of 25.3% for taxable shareholders. The results are shown for the both the benchmark and aggressive post-inversion tax rates, τ_c^I.

Panel A: Aggregate benefits and costs from inversion

		(1)	(2)	(3)	(4)
τ_c^I		Corp. tax savings	Net s.h. value	Personal tax cost	(3)/(1)
20.7%	Total, $ billion	16.85	10.21	6.64	0.39
	V.W. mean, % market cap.	4.92	2.98	1.94	0.39
	E.W. mean, % market cap.	4.92	3.19	1.73	0.35
17.9%	Total, $ billion	25.26	18.23	7.04	0.28
	V.W. mean, % market cap.	7.38	5.33	2.06	0.28
	E.W. mean, % market cap.	7.38	5.53	1.85	0.25

Panel B: Percent of shareholders with negative private return

τ_c^I		Taxable shareholders	All shareholders
20.7%	V.W.	70.0	19.5
	E.W.	56.4	15.7
17.9%	V.W.	43.7	12.1
	E.W.	42.8	11.9

Table V: **Model-Estimated Private Return to the CEO from Inversion**

This table presents statistics on the CEO's private return for the sample of observed inversions, completed and pending. Column (1) reports the model-implied market return from inversion ($p^I(x)/p(x) - 1$). Column (2) reports the CEO's private returns on their equity holdings based on the CEO's personal basis-to-price ratio. This private return, $r^I(B/p; \tau_g^j)$, is computed from the model as defined in Section 3.1.3. We construct the capital gains tax basis for each individual CEO; details are given in Appendix B.2. We assume the CEO faces the benchmark capital gains tax rate (τ_g^j) of 25.3%. Column (3) reports the private return to the CEO of their combined stock and option holdings. The return on options is estimated as the delta on option holdings (δ) times the model-implied market return: $\delta(p^I(x)/p(x) - 1)$. The CEO's total return is constructed as the value-weighted sum of the CEO's private return on equity and option holdings. The final two columns present the model-implied private return to taxable shareholders and all shareholders given in Tables III and IV, respectively. For each inversion in the data, the model-implied percentage change in the private value of holdings is calculated. The mean, median, and tenth percentile percent changes are reported.

		(1)	(2)	(3)	(4)	(5)
		Market	CEO's private return		Average	Average
τ_c^I		return	Stock	Total	taxable s.h.	all s.h.
20.7%	Mean	4.92	2.64	3.25	-1.76	3.13
	Median		3.17	3.49	-1.78	3.23
	10 pctl.		0.74	2.63	-4.47	0.80
17.9%	Mean	7.38	4.54	5.08	0.27	5.47
	Median		5.07	5.24	0.24	5.58
	10 pctl.		2.74	4.48	-2.38	3.12

Table VI: **Personal Tax Incentives and the Inversion Decision**

This table presents results from a logit regressions of a firm's inversion decision on firm characteristics, the aggregate personal tax costs to shareholders, and the CEO's private return. The dependent variable takes a value of 1 in the last fiscal year end prior to the announcement of an inversion, and 0 otherwise. M/B is the market-to-book value of assets. Foreign share of taxes is the ratio of foreign taxes paid over total taxes paid. The aggregate capital gains cost is the model-implied personal cost to all shareholders, both taxable and nontaxable, that results from the triggering of a capital gains event and the loss of the option to defer capital gains. Specifically, the aggregate cost is measured as the average capital gains cost for taxable shareholders times the fraction of shareholders that are taxable. The average capital gains cost is given by the model-implied market return from inversion $(p^I(x)/p(x) - 1)$ minus the average private return from inversion given by Equation (27). The fraction of shares held in taxable accounts is estimated using institutional ownership. See Section 3.4 for details. The CEO's capital gains cost for equity holdings is defined as the model-implied market return minus the private return based on the CEO's personal basis-to-price ratio for equity holdings, the construction of which is given in Appendix B.2. The CEO's total return to equity and options is the model-implied private return to the CEO for undergoing an inversion given their basis-to-price ratio, as defined in Section 4.1. Coefficient estimates are reported with robust t-statistics in parentheses. Significance at the 1, 5, and 10 percent levels are indicated by ***, **, and *.

	(1)	(2)	(3)	(4)	(5)	(6)
	Invert	Invert	Invert	Invert	Invert	Invert
log(Assets)	0.369***	0.370***	0.328**	0.230***	0.227***	0.226**
	(8.13)	(4.58)	(2.53)	(2.65)	(2.64)	(2.27)
M/B	0.094***	0.208***	0.193***	0.191***	0.221***	0.284***
	(8.12)	(6.13)	(4.68)	(3.59)	(4.75)	(4.70)
Cash/assets	-1.343	-2.315	-2.625	-2.562	-2.686	-2.746*
	(-1.36)	(-1.57)	(-1.61)	(-1.57)	(-1.61)	(-1.66)
Earnings/assets	1.421	2.564	1.590	1.672	1.943	2.266
	(1.28)	(1.42)	(0.67)	(0.64)	(0.79)	(1.01)
Foreign share of taxes	1.041***	1.231**	0.740	1.592***	1.566***	1.520***
	(2.97)	(2.29)	(1.20)	(2.88)	(2.81)	(2.67)
Aggregate c.g. cost		-74.947**				-73.401*
		(-2.23)				(-1.74)
Avg. c.g. cost for taxable s.h.			-1.792			
			(-0.18)			
Taxable fraction of s.h.			-7.818***			
			(-4.85)			
CEO c.g. cost (equity only)				-15.586		
				(-0.84)		
CEO total return (equity+option)					82.993***	43.788**
					(3.30)	(2.29)
Constant	-293.444***	-509.643**	-415.421**	-463.171**	-493.743***	-526.416**
	(-3.87)	(-2.57)	(-2.20)	(-2.46)	(-2.60)	(-2.54)
Observations	76362	37129	37129	17082	17082	17082
Pseudo R^2	0.116	0.165	0.221	0.091	0.106	0.137

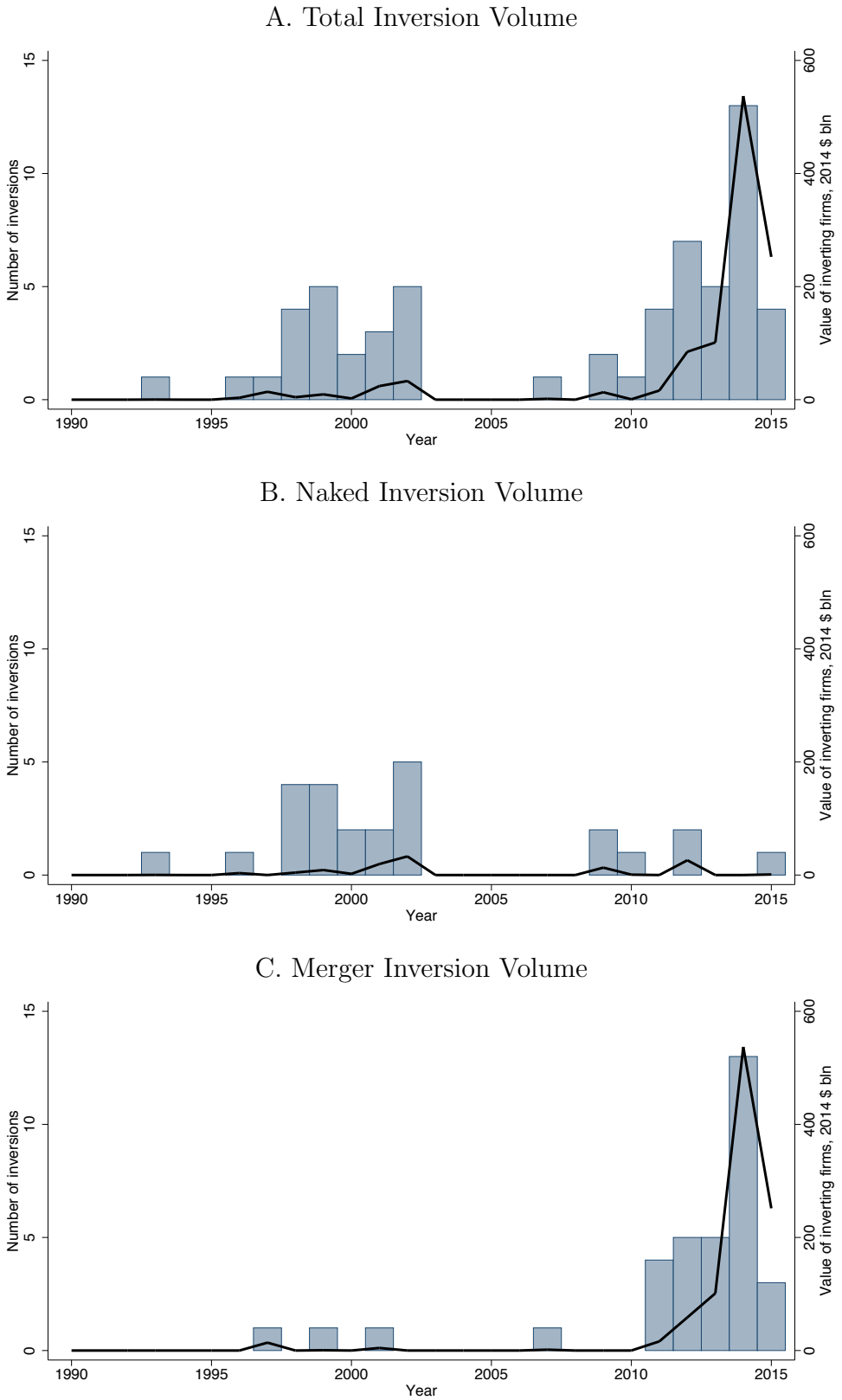

Figure 1: **Inversion Volume**. The figure displays the historical volume of inversion activity by U.S. public companies for the period 1993–2015. The vertical bars represent the number of inversions (left axis) and the line represents dollar volume (in 2014 dollars) of inversion transactions (right axis). Counts and dollar volume include both completed as well as pending or withdrawn deals. For details on the construction of these measures, see Section 2.1.

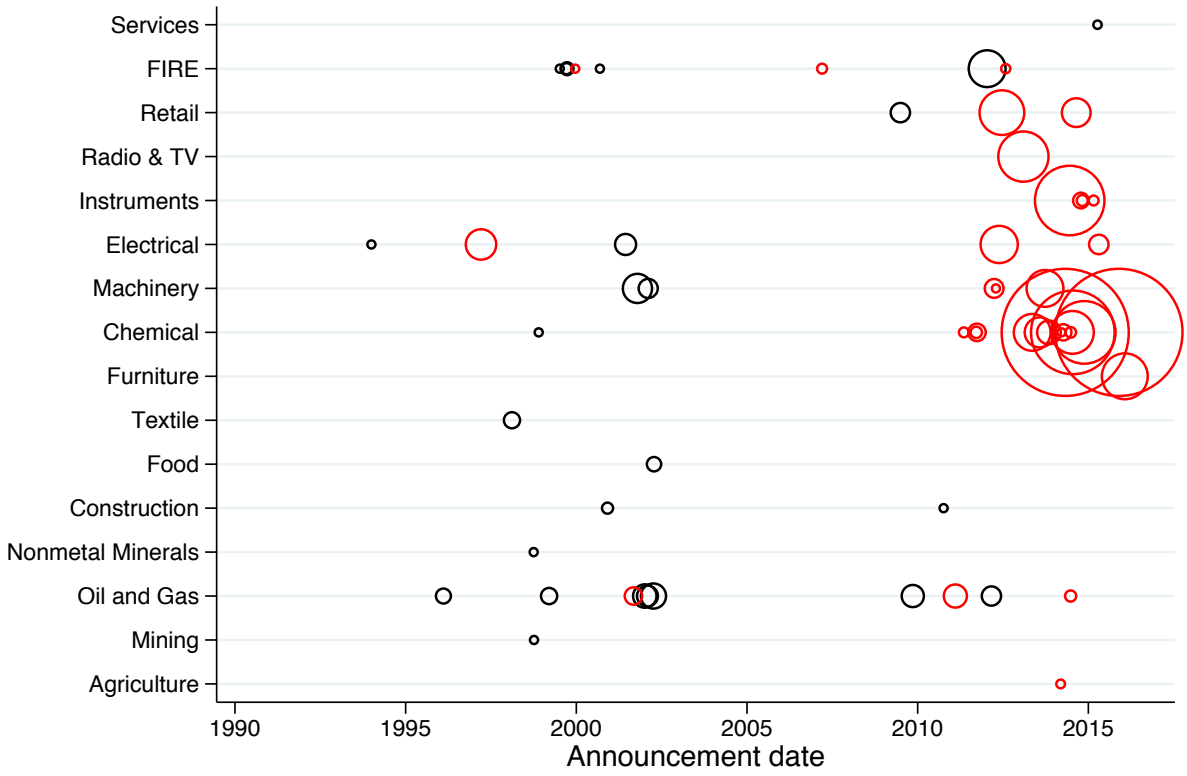

Figure 2: **Inversion Activity by Industry**. The figure displays the historical inversion activity (completed, pending, and withdrawn), by industry. Dates refer to the announcement date of the inversion. Black circles denote a naked inversion and red correspond to a merger inversion. The size of the circles corresponds to their total market value, measured as the sum of the market equity and face value of debt of the inverting firm. Industries are defined according to the Fama and French 38 industry classification.

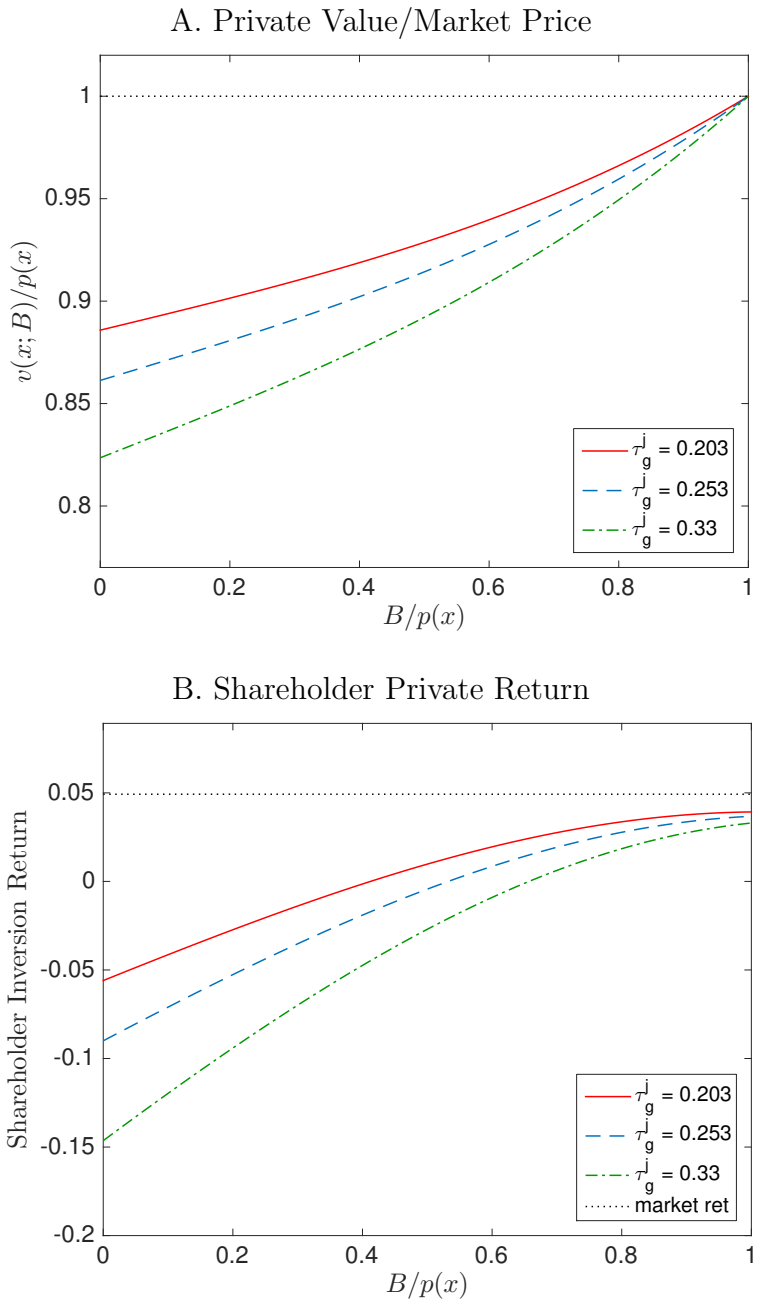

Figure 3: **Comparative statics for value/price and shareholder private return as a function of the investor's basis.** Panel A plots the ratio of a shareholder's private valuation, $v(x; B, \tau_g^j)$, to the market price, $p(x)$, of the pre-inversion firm as function of the investor's basis-to-price ratio. Panel B plots an investor's private return to an inversion as a function of their basis-to-price ratio. The investor's private return, $r^I(B/p; \tau_g^j)$, is computed from the model as described in Section 3.1.3. The black dotted line in Panel B displays the market return, computed from the model as $p^I(x)/p(x) - 1$. In both panels, values are shown for three different capital gains tax rates for the individual (τ_g^j): 20.3% (solid red line), 25.3% (dashed blue line), and 33% (dot-dashed green line). All other parameters are set to their benchmark values listed in Table II.

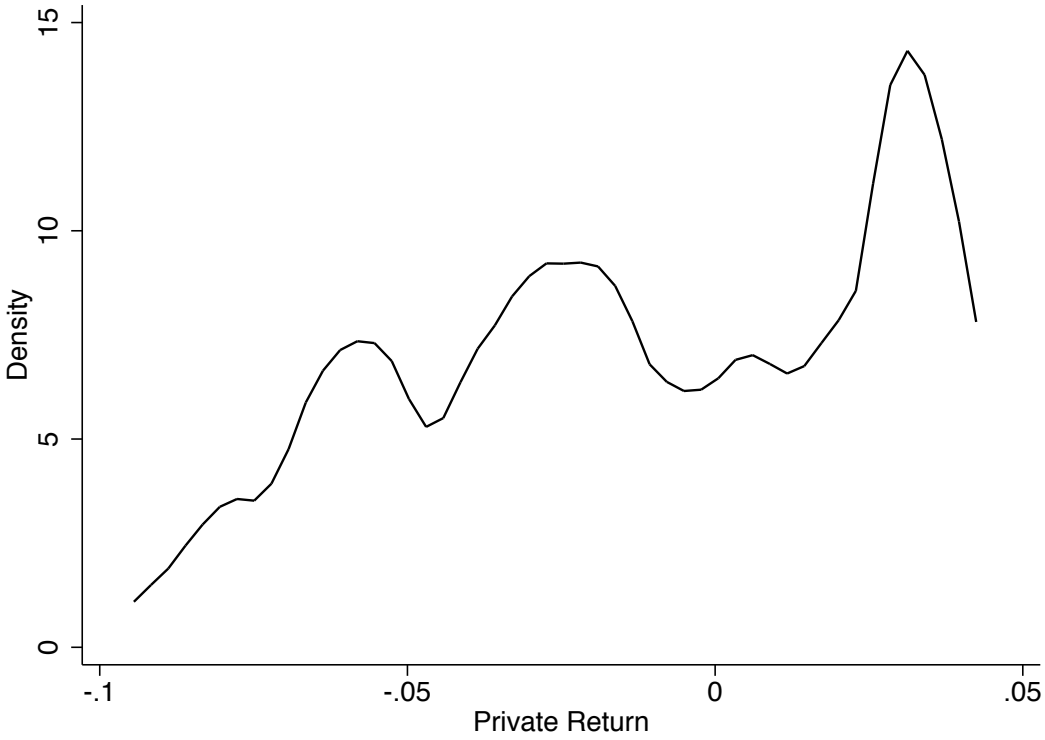

Figure 4: **Distribution of private returns for the taxable shareholder.** This figure reports the distribution of the private returns to taxable shareholders across the sample of completed and pending inversions. For each inverting firm in the sample, the distribution of shareholder bases is estimated using the approach described in Section 3.4. The private return of each shareholder (r^I) in this basis distribution is computed in the model. This gives a distribution of private returns for each inversion. The figure plots the smoothed distribution of these private returns across all the inversions in the sample, with each inversion given equal weight. The private returns are computed using the benchmark parameters, with post-inversion corporate tax rate (τ_c^I) of 20.7% and an individual capital gains tax rate (τ_g^j) of 25.3%.

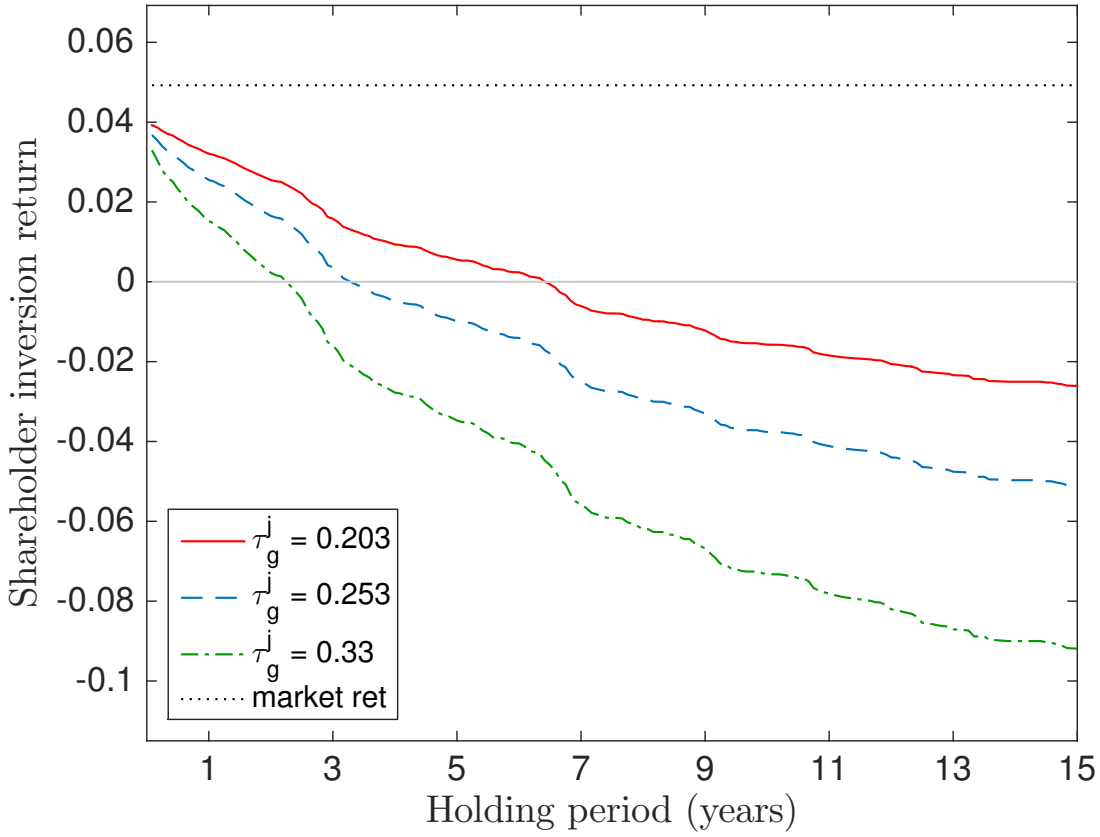

Figure 5: **Shareholder private return as a function of holding period.** The figure plots the private return as a function of the holding period and personal capital gains tax rate (τ_g^j), with a basis-to-price ratio equal to the mean across all completed and pending inversions. The low price over that period is used as the shareholder's basis. Returns are shown for three different capital gains tax rates for the individual (τ_g^j): 20.3% (solid red line), 25.3% (dashed blue line), and 33% (dot-dashed green line). The black dotted line corresponds to the model-implied market return from the inversion.