

Taxes, Managerial Compensation, and the Market for Corporate Control

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ABSTRACT

Firm investment decisions are distorted by risk-driven agency problems, shareholder taxes, and their interaction. We use variation in CEO compensation incentives, differences in firm payout strategies, and variation in personal tax rates arising from the Jobs and Growth Tax Relief Reconciliation Act of 2003 to identify the causal relation between CEO risk exposure and managerial decision-making. M&A performance is higher for CEOs that are relatively insulated from risk.

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I. Introduction

Mergers and acquisitions between two unrelated firms account for over 36 percent of all M&A transactions. The common explanations for unrelated M&A (also called diversifying M&A) suggest these deals are motivated by agency problems, where managerial objectives drive value-destroying M&A (Morck et al., 1990). Specifically, these explanations suggest that managers undertake unrelated M&A due to their high risk aversion compared to shareholders (Amihud and Lev, 1981; May, 1995), and their personal utility from empire building. These explanations are necessary because unrelated mergers do not benefit from synergies created by complementary assets, vertical connections in a supply chain, nor expanding market share (Rhodes-Kropf and Robinson, 2008; Hoberg and Phillips, 2010; Lin et al., 2018), which motivate vertical and horizontal mergers, respectively. We propose a new explanation for unrelated M&A, where managers' objectives are aligned with shareholders and these objectives are distorted by taxes.

The efficient allocation of capital depends on efficient markets, and the existence of unrelated, value-destroying mergers has been thought to indicate that the M&A market is inefficient. If we are to correct such inefficiencies, we must first understand what is causing them. If agency problems due to managers being risk-averse are driving value-destroying unrelated M&A transactions, then better compensation packages are needed to address such risk aversion. If, instead, taxes are distorting a manager's M&A decisions, then we need better tax policy. If agency problems and taxes both affect corporate investment decisions, then we need to understand how these effects interact with each other.

To start, consider that risk-averse managers may have an incentive to undertake unrelated M&A to diversify away some of the firm's idiosyncratic risk exposure. This poses an agency problem because shareholders would prefer these managers to distribute retained earnings to

them and allow them to diversify on their own through other investments. While this channel may explain some of the unrelated mergers we observe, we suggest the explanation may be more complicated. In particular, this explanation ignores the fact that earnings distributions—via dividend payouts and share repurchases—trigger a tax liability for shareholders due to dividend and capital gains taxes.

Managers, acting on behalf of shareholders, may have an incentive to undertake diversifying M&A in an effort to avoid these dividend and capital gains taxes. In particular, shareholders may want to use retained earnings to diversify their holdings by investing in an unrelated firm. They could do this by having the firm pay a dividend to them and then invest the dividend in another firm themselves. They could also do this by having the firm they own acquire the target firm directly. The benefit of the former is increased flexibility. The benefit of the latter is that it avoids the dividend tax that would be triggered in the former approach. In this way, mergers and acquisitions may help firms free trapped equity. Before 2003, when the top marginal tax rate on dividends was 39.6%, the benefit of the latter may have been quite large (Ohrn and Seegert, 2019).

To study these distortions to M&A decision-making, we incorporate unrelated mergers, agency costs, and the trapped equity channel into a canonical model of acquisitions, and we investigate their interactions. First, we show that dividend taxation creates trapped equity and provides an incentive for unrelated acquisitions. Second, we show that dividend taxation interacts with agency costs separate from the trapped equity incentives. Third, we show that the effect of increasing the dividend tax rate on unrelated mergers is theoretically ambiguous. In particular, higher dividend tax rates increase the incentives to undertake unrelated mergers due to trapped equity but decrease the incentives due to lowering managers' risk exposure. In essence, an increase in the dividend tax rate transfers some risk from the firm (and manager)

to the government—a point first discussed by Domar and Musgrave (1944). The overall effect of the dividend tax on unrelated mergers is therefore an empirical question.

We use a quasi-natural experiment created by the Jobs and Growth Tax Relief Reconciliation Act of 2003 (henceforth, the 2003 tax reform) that dramatically changed the tax treatment of dividend payouts. The advantage of using this tax change is that it allows us to isolate the effect of taxes as a driver of unrelated M&A, holding fixed agency issues because, for example, CEO risk aversion is unlikely to have simultaneously changed in a significant way following the 2003 tax reform. We further control for other macroeconomic factors that may influence the overall market for acquisitions by using related mergers (i.e., vertical and horizontal M&A) as an additional control in a differences-in-differences empirical design.

We find that when the dividend tax is reduced, dividend-paying firms pursue fewer unrelated deals. Specifically, we find that these firms spend 85% less on unrelated acquisitions per year and are substantially less likely to undertake an unrelated deal when the dividend tax is lower. In contrast, we find no significant difference in related M&A expenses or the likelihood to undertake related deals. We also find that the quality of the unrelated M&A undertaken increases substantially when the dividend tax rate is lower, which suggests dividend-paying firms forgo the worst unrelated deals when they no longer need to use diversifying M&A to free trapped equity. Specifically, we find that dividend-paying firms realize an increase in unrelated M&A announcement returns of 17.6 percentage points, relative to the announcement returns of related deals. This empirical evidence is consistent with trapped equity distorting unrelated M&A behavior.

We complement our baseline analysis with an additional test of our model. Specifically, we investigate the heterogeneous effect of the dividend tax rate on unrelated M&A for managers with more or less risk-related agency problems. While the model suggests that the effect of the dividend tax rate on unrelated mergers is ambiguous, the model predicts that this effect is

unambiguously more positive for firms with larger risk-related agency problems. Empirically, we measure manager's risk-related agency problems using CEO vega, which measures the convexity of compensation policies that shareholders set to overcome managerial risk aversion (Coles et al., 2006).

We find that dividend-paying firms with high CEO vega, i.e., those with less risk aversion, realize more positive post-2003 unrelated M&A returns than did those with low CEO vega. Specifically, the announcement returns from unrelated deals improved by 34.2 percentage points after the 2003 tax reform for high CEO vega acquirers, relative to low vega acquirers. This difference in the unrelated M&A performance of high versus low CEO vega firms is robust to an array of different econometric specifications, including the use of entropy balancing, which is a generalization of propensity score matching that creates balance across the treatment and control groups.

We consider an additional feature of CEO compensation that impacts the risk-related agency problems of the CEO, effective ownership. Effective CEO ownership, often captured by CEO delta, has two relevant effects, one pertaining to incentive alignment for increasing value, and the other pertaining to risk exposure. We find weak evidence that low delta acquirers' unrelated deals outperform those of high delta acquirers. The imprecision of this effect may be driven by the fact that decreased delta leads to less firm-specific risk exposure but also contributes to reduced incentive alignment between the CEO and shareholders.

To see how these two features of executive compensation, CEO vega and CEO delta, interact, we consider the effect of low CEO delta among the subset of firms with high CEO vega. These are the *least* risk-averse CEOs because they have low effective ownership and high compensation convexity. As such, they are the least likely to pursue unrelated M&A as a diversification strategy, so their gains in unrelated M&A returns should be the highest post-2003, where trapped equity is less of an issue. Consistent with this, we find that the unrelated M&A

returns of low CEO delta acquirers that also have high CEO vega are significantly greater than the unrelated M&A returns of high delta acquirers.

This paper contributes to a large literature on mergers and acquisitions. We provide a novel explanation for unrelated mergers and show that it interacts with other common explanations. Our work is, therefore, closest to recent work by Lin et al. (2018), who investigate the role of risk-averse CEOs trying to reduce their personal risk exposure as an explanation for different types of M&A. Our work also complements Gormley and Matsa (2014), who find evidence that risk-related agency issues affect merger and acquisition decisions.

We also contribute to a literature that discusses how taxes affect M&A decisions. Ayers et al. (2002) and Dhaliwal et al. (2003) show taxes affect merger and acquisition financing. Desai and Hines Jr. (2002), Huizinga and Voget (2009), and Voget (2011) show that taxes affect organizational form and headquarter locations. We complement this work by showing that personal taxes affect the types of acquisitions that firms undertake.

II. Theoretical Framework

This section uses a neoclassical two-period model, combined with a simple agency model, to show how acquisitions are affected by both tax frictions and agency concerns.

A. Shareholder Preferences

Consider a single firm, denoted Firm 1, that has stochastic production such that its value is distributed normally with mean V and variance σ^2 . At the beginning of period 1, Firm 1 has an opportunity to acquire a randomly selected target firm, denoted Firm 2. The acquisition is

characterized by the target firm's retained earnings, C , production technology, $g(\cdot)$, synergy parameter, $\theta \in [0, \infty)$, and the percent change in Firm 1's volatility $\phi = \Delta\% \sigma^2$. Firm 1 values Firm 2 more if its assets are more related (higher synergies, θ), with willingness to pay for Firm 2 in the absence of taxes $\theta(g(C) + C)$. A merger is defined as a related acquisition if $\theta > 1$ and an unrelated acquisition if $\theta < 1$. Given the acquisition opportunity, $(C, g(\cdot), \theta, \phi)$, Firm 1 decides whether to make the acquisition, $Y = 1$, or not, $Y = 0$.

In period 1, Firm 1 also decides the amount of its retained earnings, X , to pay as a dividend $D \geq 0$, where dividends are taxed at the rate τ_d .¹ Firm 1's level of investment is determined by its dividend choice, $I = X - D$.

In period 2, investment generates net profits $f(I)$, where $f(\cdot)$ is a strictly concave function.² Shareholders hold equity and government bonds with an untaxed rate of return of $r > 0$.³ For expositional ease, we assume Firm 1 liquidates at the end of period 2, returning its principle and profits, which are taxed at the dividend tax rate τ_d , to shareholders.

B. Shareholder Payoffs

If Firm 1 does not make an acquisition, $Y = 0$, its value depends on its dividend choice D_0 , where the subscript denotes no acquisition,

$$(1 - \tau_d)V_0 = (1 - \tau_d)D_0 + (1 - \tau_d)\frac{f(X - D_0) + X - D_0}{1 + r}. \quad (1)$$

¹In the model, we abstract from share repurchases as a method of distributing retained earnings. For a discussion of tax frictions with dividend-paying and share-repurchasing firms see Ohn and Seegert (2019) and Coles et al. (2020).

²The net profits function is defined as $f(I) = F(I) - \delta I$, where $F(I)$ is the gross production function, which includes the depreciation of capital used for production. The functional form of the net profits function is left general in the text of the paper; however, a parametric example where $f(I) = \frac{1+e}{e}AI^{\frac{e}{1+e}}$ can be used.

³The analysis abstracts from general equilibrium effects on the rate of return to government bonds by assuming it is exogenous to the model.

If Firm 1 does make an acquisition, $Y = 1$, it gains the assets $\theta(g(C) + C)$ and pays Firm 2's shareholders M , which is defined as the value of Firm 2 to its shareholders.⁴ The cost of the acquisition is therefore given by

$$M = (1 - \tau_d) \frac{g(C) + C}{1 + r}. \quad (2)$$

We maintain the assumption that Firm 1 has an abundance of cash ($f'(X - M) < r$) such that to pay for the acquisition Firm 1 makes fewer dividend payments, $D_1 = D_0 - M$.⁵ The value of the firm when an acquisition is made is

$$(1 - \tau_d)V_1 = (1 - \tau_d)D_1 + (1 - \tau_d) \frac{f(X - (D_1 + M)) + \theta(g(C) + C) + I}{1 + r}. \quad (3)$$

C. Manager Payoffs

The decision to make an acquisition combines both shareholder value and the manager's incentives to undertake the project.

We allow shareholders to set compensation to better align shareholder and manager value. Shareholders can align incentives of the CEO through effective ownership, $\delta \in [0, 1]$, by way of an accumulation of stock and options net of dispositions Coles et al. (2006). A CEO's wealth, $w = w_0 + \delta V$, is a convex combination of wealth from outside the firm w_0 and firm value. Shareholders can also add convexity to the compensation policy through CEO vega, $v \in [0, \rho]$, by including features such as option grants Guay (1999). Shareholders can increase CEO vega and, as a consequence, decrease the CEO's effective risk aversion $\tilde{\rho} = \rho - v$.

⁴Defining M as the value of Firm 2 to its shareholders implicitly assumes the market for acquisitions is competitive such that Firm 2's shareholders are indifferent between selling the firm and receiving M . The assumption that the market for acquisitions is competitive does not affect the results. See Ohrn and Seegert (2019) for details.

⁵See Ohrn and Seegert (2019) for a model that considers cases where Firm 1 has scarce cash and may issue equity. We assume that the firm makes the same investment, I , regardless of M&A activity.

We follow the model of corporate investment in Coles et al. (2012) and assume the manager has CARA utility over wealth,

$$U = -e^{-(\rho-v)(w_0+(1-\tau_d)\delta V)}. \quad (4)$$

The manager maximizes her expected utility taking into account risk aversion, which is equivalent to maximizing

$$w_0 + (1 - \tau_d)\delta\mu - \frac{1}{2}(\rho - v)\delta^2(1 - \tau_d)^2\sigma^2, \quad (5)$$

where μ is the expected value of the firm and σ^2 is its variance.

D. Equilibrium Behavior

This section derives the equilibrium behavior of the firm determined by the manager who balances the incentives of Firm 1's shareholders and her private incentives. An equilibrium is characterized by the manager's dividend payment and acquisition choice (D^*, Y^*) . In equilibrium, the manager accepts an acquisition opportunity if the convex combination of the shareholders' and manager's payoffs with the acquisition is greater than the shareholders' and manager's payoff without the acquisition. The difference in the value of the firm, with and without an acquisition, is given by $V_1 - V_0$ defined in Equations (1) and (3). Firm 1's expected value increases with the assets net of taxes and decreases with the forgone distributions in the first stage,

$$(1 - \tau_d)(V_1 - V_0) = \theta M - (1 - \tau_d)M. \quad (6)$$

We derive Equation (6) by combining Equations (1)–(3).

The condition necessary for a CEO's decision to pursue an M&A transaction occurs when the manager's utility is the same with or without the deal. As ϕ is the percent change in

volatility, σ^2 , we define $\gamma M^2 = 1 - \phi$ so $\phi = 1 - \gamma M^2$, where γ gets re-scaled by average M . This captures the notion that larger deals have a greater impact on firm risk. We set manager utility with an M&A transaction to be equal to manager utility without an M&A transaction as follows:

$$(1 - \tau_d)\delta V_0 - \frac{1}{2}(\rho - v)\delta^2(1 - \tau_d)^2\sigma^2 = (1 - \tau_d)\delta V_1 - \frac{1}{2}(\rho - v)\delta^2(1 - \tau_d)^2\sigma^2(1 - \gamma M^2). \quad (7)$$

Rearranging terms gets us:

$$(1 - \tau_d)(V_1 - V_0) = -\frac{1}{2}(\rho - v)\delta(1 - \tau_d)^2\sigma^2\gamma M^2. \quad (8)$$

Combining Equations (6) and (8), we get that the manager accepts a deal only if the synergy value is greater than

$$\theta^* = (1 - \tau_d) - \frac{1}{2}(\rho - v)\delta(1 - \tau_d)^2\sigma^2\gamma M. \quad (9)$$

In equilibrium, the set of related acquisitions a firm accepts is given by $\theta \in [1, \infty)$ and the set of unrelated acquisitions is given by $\theta \in [\theta^*, 1]$.

The fact that the equilibrium threshold is below one has several implications. First, firms will undertake unrelated mergers as long as the dividend tax is positive and there are agency problems related to risk. The first term on the right-hand-side gives the incentive due to trapped equity, and the second term gives the incentive due to risk-related agency problems. Second, changes in the dividend tax rate or risk-related agency problems affect the set of unrelated mergers but not related mergers. Finally, the average quality of unrelated mergers is increasing with the threshold θ^* . This last point suggests investigating changes in M&A

announcement returns to identify changes in the threshold θ^* , which mirrors the approach used in Ohn and Seegert (2019).

E. Changes in M&A Due to Risk

This section considers how equilibrium acquisition behavior changes with the dividend tax rate. First, the derivative of the threshold synergy level with respect to the dividend tax is

$$\frac{\partial \theta^*}{\partial \tau_d} = -1 + (\rho - \nu)\delta(1 - \tau_d)\sigma^2\gamma M \geq 0. \quad (10)$$

PROPOSITION 1 *An increase in the dividend tax rate has an ambiguous effect on the threshold for the acquisitions firms undertake.*

In practice, it is an empirical question as to the effect of dividend taxation on unrelated mergers. The ambiguous result is due to the countervailing effects of two different forces. First, higher dividend tax rates increase the trapped equity incentive to undertake more (and lower quality) unrelated acquisitions. In Equation 10, this is given by the first term. Second, higher dividend tax rates decrease manager's effective risk aversion by shifting some risk to the government. This decrease in risk aversion decreases risk-related agency problems and lowers the incentive to undertake unrelated acquisitions. Our empirical analysis tests which of these forces is greater.

We consider heterogeneous responses to changes in the dividend tax rate as an additional test of the model. In particular, we consider differences in a manager's risk-related agency problems that change the relative trade-off between trapped equity and the interaction between taxes and risk-related agency problems. To do this, we take an additional partial derivative with respect to ν . Differentiating $\partial \theta^* / \partial \tau_d$ with respect to ν leads to the following:

$$\frac{\partial(\partial\theta^*/\partial\tau_d)}{\partial v} = -(1 - \tau_d)\delta\sigma^2\gamma M < 0. \quad (11)$$

PROPOSITION 2 *The effect of changes in the dividend tax rate is smaller for managers with less effective risk-aversion.*

In practice, shareholders implement compensation packages to limit risk-related agency problems. Proposition 2 suggests that managers with compensation policies that limit their effective risk aversion will have more negative responses to a dividend tax rate increase.

We can also consider the heterogeneous responses to changes in the dividend take rate depending on the level of effective CEO ownership within the firm. To do this, we take the partial derivative of Equation 10 with respect to δ . This leads to the following:

$$\frac{\partial(\partial\theta^*/\partial\tau_d)}{\partial\delta} = (\rho - v)(1 - \tau_d)\sigma^2\gamma M > 0. \quad (12)$$

We are particularly interested in the effect of *low* effective ownership, as low ownership reduces incentive alignment with shareholders, but also reduces a CEO's firm-related risk aversion. Considering a decrease in effective ownership flips the sign of the inequality in Equation 12.

PROPOSITION 3 *The effect of changes in the dividend tax rate is smaller for managers with less effective ownership.*

III. Data Collection and Construction

As we focus on corporate investment in mergers and acquisitions, we combine SDC M&A data, Compustat financial characteristics, and CRSP return data to create a panel from 1998 to 2008.⁶ We exclude deals announced in the year of the tax reform, 2003. We use the Special Merger database in SDC to identify deals that are classified as completed and that resulted in 100% ownership by the acquirer after the transaction was finished. We drop deals in which the acquirer is a financial or utility firm (i.e., SIC first digit is 6 or first two digits are 49, respectively), the target is not domiciled in the US, the deal is a self-acquisition, or the deal was performed by a serial-acquirer (i.e., a firm that makes more than 20 acquisitions in the sample period, which are mostly holding companies in the banking industry). Merging this SDC sample of M&A deals with Compustat financial data and CRSP daily returns data yields an initial sample of 5,553 acquisitions.

A. Unrelated and Related Mergers

We classify deals as either unrelated or related. Unrelated, or diversifying, deals are less likely to benefit from synergies among the target's and acquirer's assets, as the businesses to be combined will be relatively unrelated. The primary objective, instead of generating surplus, is often risk reduction. Other possible motivations for diversifying deals could be empire building by the CEO or freeing trapped equity. In contrast, vertical and horizontal mergers are much more likely to be motivated by positive synergies, including those that enhance revenue, reduce costs, and create financial advantages. A vertical merger combines companies that previously sold to or bought from each other vertically along the supply chain. A horizontal merger joins companies offering similar, compatible, or symbiotic products or services.

⁶This is the same time range used by Ohrn and Seegert (2019).

We classify vertical and horizontal M&A as related, while all others deals are classified as unrelated. To empirically implement this taxonomy, we follow the procedure of Fan and Goyal (2006) and Lin et al. (2018). We use the input-output (I/O) data from the Bureau of Economic Analysis (BEA) to construct a measure of vertical relatedness between any two industries. We categorize an acquisition as vertical if the vertical relatedness coefficient between the acquirer and target is larger than 3%. Lin et al. (2018) use thresholds of both 1% and 5%, so we perform our main analysis using the mid-point between these two thresholds.⁷ We classify an acquisition as horizontal if the acquirer and target share the same two-digit SIC code and do not meet the threshold for a vertical relation. We group vertical and horizontal mergers as related. We classify the remaining deals, those that are neither vertical nor horizontal, as unrelated.

B. Performance Measures

To measure the performance of firms after an M&A deal announcement, we calculate buy-and-hold abnormal returns (BHARs) for 24 months after the merger announcement. This follows prior literature on the method and application to long-run performance of acquisitions (Lyon et al., 1999; Megginson et al., 2004; Duchin and Schmidt, 2013).⁸ We calculate BHARs from the CRSP daily return data using the Fama-French 3-factor model to capture expected returns absent an acquisition.

⁷Figures A.1a–A.1c show that our estimates are quite similar when any value in this range is used as the threshold for vertical relatedness.

⁸Our use of buy-and-hold abnormal returns is not without consideration of other potential appropriate measures (Fama and French, 1998; Lyon et al., 1999; Kothari and Warner, 2006), and bad-model problems are a concern (Fama, 1970). Our difference-in-differences approach mitigates some of the concerns of misspecification of abnormal returns because it differences out potential level biases created by the abnormal return generation process.

C. Dividend-Paying and Share-Repurchasing Firms

To utilize additional variation imposed by the 2003 tax reform, we use variation across firms in how they distribute earnings (dividends or share-repurchases). Based on behavior before 2003, we group acquiring firms into one of four categories: dividend-paying; share-repurchasing; neither; or both. We classify an acquiring firm as dividend-paying if, before 2003, the firm made dividend payments but did not perform repurchase shares. Similarly, we classify an acquiring firm as share-repurchasing if, before 2003, the firm repurchased shares but did not make dividend payments.

Firms that regularly pay dividends rarely adjust their practices, as markets respond negatively to decreases in, and elimination of, dividend payouts (Brav et al., 2005). Similarly, firms that tend to repurchase shares maintain this practice at a steady rate, especially among large firms with little variation in their operating income (Jagannathan and Stephens, 2003). Because of this, the firms we classify as dividend-paying firms and share-repurchasing firms in the pre-2003 period are also defined this way in the post-2003 period. This ensures that the tax reform is exogenous to how we define dividend-paying and share-repurchasing firms.⁹

D. CEO Compensation Convexity

We use CEO wealth-volatility sensitivity (CEO vega) to capture the risk-taking incentives of CEOs. Following Guay (1999), CEO vega is computed as the dollar change in the expected value of the CEO's portfolio of accumulated stock and options awards net of dispositions to a

⁹While we address the question in detail below, we acknowledge here the potential concern that share-repurchasing firms might not be suitable as a basis for comparison for dividend-paying firms. We ameliorate this concern by showing that the assumption of parallel trends is satisfied and that our results are the same when we use entropy weighting in our empirical estimations.

1% change in the annualized standard deviation of the stock returns of that firm.¹⁰ We partition the sample of acquisitions based on whether the acquiring firm has CEO vega that is above or below median value relative to other firms in its same industry in the year of the deal. As CEO vega information is not available for every acquiring firm in our sample our sample is reduced to 1,147 deals when we consider CEO vega.

E. CEO Effective Ownership

We use CEO effective ownership (CEO delta) to capture the CEO's incentive alignment with shareholders, as well as their exposure to firm-specific risk. CEO delta is computed as the dollar change in the value of a CEO's portfolio of accumulated stock and option grants net of dispositions to a 1% change in the stock price. We partition the sample of acquisitions based on whether the acquiring firm has CEO delta that is above or below median relative to other firms in its same industry in the year of the deal. As CEO delta information is not available for every acquiring firm in our sample our sample is reduced to 1,111 deals when we consider CEO delta.

F. Summary Statistics

Table 1 provides summary statistics as context to evaluate our empirical results. It is important to note that our empirical design neutralizes the differences in financial characteristics across mode of payout, time, and compensation structure. This table also separately reports the post-acquisition market performance of dividend-paying and share-repurchasing acquirers.

¹⁰We are grateful to Lalitha Naveen for making these data available: <https://sites.temple.edu/lnaveen/data/>. It is also worth noting that previous research finds mixed evidence regarding the relation between CEO vega and firm risk-taking (Carpenter, 2000; Ross, 2004; Brick et al., 2012; Sandvik, 2020).

IV. Identification and Results

A. Identification

To test our predictions, we use difference-in-differences estimations that employ a shock to the dividend tax rate via the Jobs and Growth Tax Relief Reconciliation Act of 2003. This approach removes any omitted variable bias from strategic, non-random, or confounded selection into the groups of interest that we study. We consider variations in the types of deal pursued—related versus unrelated—in the payout strategies employed—dividend-paying versus share-repurchasing—and in the risk-taking incentives of CEOs—high versus low CEO vega and delta.

As usual in these models, our estimates capture the causal effect in the absence of other types of omitted variable bias that affect variation between groups differently.¹¹ Said another way, we recover the casual effect even if there are level differences between groups. In practice, this means that coefficients other than those of interest can be non-zero, which means the specification is working to net out those differences.¹² The concern would be if different groups had different trends, of which, through a battery of tests, we find no evidence.

All difference-in-differences estimations rely on the assumption that treated and untreated firms would follow a common trend in the absence of other changes. To evaluate the credibility of this assumption, we investigate trends between groups following the two standard approaches (Fowlie et al., 2018; Cengiz et al., 2019). First, we present graphical analyses to show that the unrelated M&A returns of treated and control firms follow a common trend in

¹¹Reverse causality likely is a limited concern. Specifically, reverse causality would imply that current CEO merger decisions determine the payout methods and compensation packages of their firms in the past.

¹²The other coefficients in the difference-in-differences specification are sometimes referred to as nuisance parameters (Cameron and Trivedi, 2005). Specifically, the estimate of β is consistent even if these nuisance parameters are not consistent.

the pre-2003 period. Second, we report p-values from formal tests of differential trends. Both of these tests use the following event study analysis:

$$\text{BHAR}_{i,t} = \sum_t \delta_{i,t} (\mathbb{I}(\text{time} = t) \times \text{Treated}_i) + \beta_i \text{Treated}_i + \sum_t \lambda_t \mathbb{I}(\text{time} = t) + \varepsilon_{i,t}. \quad (13)$$

The main coefficients of interest are $\delta_{i,t}$, which capture differences in baseline time effects for deals performed by treated firms relative to the common time effects for the untreated firms, λ_t . When comparing dividend-paying firms to share-repurchase firms, *Treated* equals one if the firm makes dividend payouts and if the deal is unrelated, and zero otherwise. When comparing high CEO vega (delta) firms to low CEO vega (delta) firms, this indicator equals one if the firm's CEO has above median CEO vega (delta) and if the deal is unrelated, and zero otherwise.

Figure 1a graphs the differential trends when *Treated* captures (*Unrelated x Dividend Firm*) and 95% confidence intervals from 1998–2008. These triple differences-in-time estimates show no diverging pre-trends and an apparent increase in the coefficient in years after the reform. We test if the plotted coefficients are jointly equal to zero across the period from 1998 to 2002 to determine whether the trends in the returns to unrelated and related M&A follow a common trend in the pre-period. We fail to reject the null that the coefficients are jointly equal to zero with a p-value of 0.8179. These results suggest that dividend-paying firms and share-repurchasing firms had similar pre-2003 trends in the differences in returns between their unrelated and related M&A.

To test the effects of a CEO's compensation convexity and effective ownership on M&A outcomes, we focus on dividend-paying firms, as these are the firms that experienced the greatest tax distortion in 2003. Figure 1b shows the differential trends in M&A returns among dividend-paying firms when *Treated* equals (*Unrelated x High Vega*). These triple differences-

in-time estimates show no diverging trends (p-value = 0.7139) and an apparent increase in the coefficient in years after the reform. Figure 1c shows the differential trends when *Treated* equals (*Unrelated x Low Delta*). Again, we find no evidence of divergent pre-trends, as the p-value from the joint test of equality equals 0.2568.

B. Changes in Unrelated and Related M&A Returns

We now investigate the theoretical predictions in Section II by considering how post-acquisition returns changed after M&As for different sets of firms. First, we consider the effect of the dividend tax by considering the effect of the 2003 tax reform on unrelated mergers undertaken by dividend paying firms. Recall from Section II that the theoretical effect is ambiguous because the trapped equity and risk channels produce countervailing effects. An increase in the threshold level θ suggests that M&A quality should increase, and vis versa. We investigate changes in M&A quality by measuring the differences in BHARs 24 months after an acquisition, to capture changes in average synergy quality following Ohrn and Seegert (2019). Our empirical tests, therefore, provide evidence as to which of these two effects is larger.

We adapt the empirical model used in Ohrn and Seegert (2019) to test the effect on unrelated deals. Specifically, we use buy-and-hold abnormal returns (BHARs) 24 months after an acquisition as our dependent variable as a measure of acquisition quality. Using variation in M&A deal type (related vs. unrelated), firm payout policy, and taxation before and after the 2003 tax reform, we perform triple-differences estimations using the following equation:

$$\begin{aligned} \text{BHAR}_{i,t} = & \alpha_0 + \beta_1(\text{Post} \times \text{Unrelated} \times \text{Dividend Firm})_{i,t} + \beta_2(\text{Post} \times \text{Unrelated})_{i,t} \\ & + \beta_3(\text{Post} \times \text{Dividend Firm})_{i,t} + \beta_4(\text{Unrelated} \times \text{Dividend Firm})_{i,t} \\ & + \beta_5(\text{Post}) + \beta_6(\text{Unrelated}) + \beta_7(\text{Dividend Firm}) + X_{i,t} + \epsilon_{i,t}, \end{aligned} \quad (14)$$

where an observation is a deal, i , in year t , and $\varepsilon_{i,t}$ is a deal-level error term. The variable *Post* equals one for deals announced after 2003, and zero otherwise; *Unrelated* equals one if the deal is neither a vertical nor horizontal deal, and zero otherwise; and *Dividend Firm* equals one if the deal is performed by a dividend-paying firm, and zero otherwise. X is a matrix of financial controls, which includes firm size, return on assets, debt ratio, cash flow, and financial distress.¹³

We display the results of this estimation in Table 2. The point estimate on (*Post-2003 x Unrelated x Dividend Firm*) in Column (1) can be interpreted as the change in the unrelated deal returns relative to the change in the related deal returns of dividend-paying versus share-repurchasing firms. The positive and significant point estimate suggests the unrelated deals of dividend-paying firms improve by over 17 percentage points after the 2003 tax reform. This evidence suggests that trapped equity is driving unrelated acquisitions and that this effect is larger than the risk effect.

If there is any concern that related M&A do not provide an ideal benchmark for studying the changes in unrelated M&A, entropy weighting helps to improve pre-treatment comparability (Hainmueller, 2012). Specifically, entropy weighting allows for unobserved factors, potentially those that are correlated with observed factors, to vary across the treatment and control group by weighting the data on the two to be similar ex-ante. This effectively relaxes the common trend assumption. We implement this procedure by balancing the treatment and controls group based on firm size, return on assets, debt ratio, cash holdings, and financial distress. The positive and significant point estimate in Column (2) of Table 2 shows that our main result holds when using this generalization of propensity score matching.

¹³These and all other variables are defined in Table A.1.

C. Heterogeneous Tax Effects by CEO Compensation

We now test Proposition 2, which states that the effect of the dividend tax rate on unrelated mergers is more positive for firms with greater risk-related agency problems. The implication from this proposition, therefore, is that the quality of M&A undertaken will increase for firms with greater risk-related agency problems. We follow Ohn and Seegert (2019) and measure M&A quality by using BHARs 24 months after an acquisition.

We continue to use variation in time, across the 2003 tax reform, and variation in the types of deals, unrelated versus related to test the prediction in Proposition 2. To capture differences in risk-related agency concerns, we categorize acquiring firms as either high vega or low vega based on the median level of vega among the acquiring firm's industry in the year of the deal. We also restrict our sample to dividend-paying firms, as these are the firms that experience the greatest distortion to their M&A activity due to changes in the dividend tax rates.¹⁴ We then estimate a variation of equation (14), replacing *Dividend Firm* with *High Vega* to capture heterogeneity in CEO's exposure to risk-related agency conflicts.

We show in Column (3) of Table 2 that the returns to unrelated M&A increase significantly among dividend-paying firms with high CEO vega, relative to those with low CEO vega. The point estimate on $(Post-2003 \times Unrelated \times High\ Vega)$ suggests that high vega firms realized returns to unrelated M&A that increased by 34.2 percentage points more than did the unrelated M&A of low vega firms. Column (4) shows that this effect is very similar in both magnitude and precision when we employ entropy balancing. These results provide strong evidence in support of Proposition 2, as CEOs with less firm-specific risk aversion realize improved unrelated M&A returns after the 2003 tax reform.

¹⁴We also do this to make the interpretation of our empirical results more tractable, as restricting to dividend-paying firms prevents us from introducing a quadruple-difference term into our model. See Coles et al. (2020) for a model that delineates between payout type while assessing the interactive effects of personal tax rate change and CEO compensation convexity on M&A synergy thresholds.

We test Proposition 3 using a very similar adaptation of equation (14), but we replace *Dividend Firm* with *Low Delta*. Reduced effective CEO ownership decreases managers' exposure to firm-specific risk, which decreases their incentive to use unrelated M&A to diversify their risk exposure. Column (5) of Table 2 reports a positive coefficient on $(Post-2003 \times Unrelated \times Low Delta)$. Similarly, Column (6) reports a positive point estimate when implementing a generalization of propensity score matching. Neither of these estimates are statistically significant.

To dig deeper into the interactive effect of CEO compensation contracts and personal taxes on M&A decisions, we consider instances in which CEOs are relatively insulated from risk by restricting the sample to high CEO vega acquirers. Column (5) shows that the returns to unrelated M&A among low delta acquirers is 52.3 percentage points greater than that among high delta acquirers that also have high CEO vega.¹⁵ This effect is statistically significant and robust to the use of entropy balancing. Taken together, these results provide evidence in support of Proposition 3.

V. Additional Analysis

A. Robustness Tests

Table 3 shows that our main results are robust to a host of different empirical specifications. Column (1) in Panels A, B, C, and D restate the results from Columns (1), (3), (5), and (7), respectively, of Table 2. In Column (2), we cluster the standard errors by firm and year and show that the statistical significance of the results is similar to the baseline inference that uses robust standard errors. In Column (3), we cluster the standard errors by year only and include

¹⁵The results are similar if instead we use a quadruple difference specification.

year fixed effects into the model, and our main results continue to hold. Columns (4) and (5) show that our results are similar when we include deals announced in 2003, the year of the tax reform, into either the post-2003 or pre-2003 period. Finally, Column (6) again implements entropy balancing, but in a model that includes year fixed effects. The results from these tests continue to be similar to those in Table 2. Taken together, our results do not appear to be sensitive to our choice of econometric specification.

We also conduct robustness tests based on different decision-rules used to categorize M&A as vertical deals. As mentioned in Section III, Lin et al. (2018) use vertical intergration coefficient thresholds of both 1% and 5%, so we perform our main analysis using the mid-point between these two thresholds, 3%. In Figures A.1a–A.1c, we show that our estimates from Table 2 are quite similar when any value from 1%–5% is used as the threshold for vertical relatedness. This is especially true for our results that consider heterogeneity based the compensation convexity of a CEO’s incentive contract.

B. The Effect of the Tax Reform on M&A Expenditures

Our model implies that the positive returns to post-2003 unrelated M&A are the result of dividend-paying firms reducing their diversifying M&A activity. As a result, they do fewer unrelated deals, forgoing the worst deals—leading to improved returns. To test that less unrelated M&A activity is taking place, we use our difference-in-differences estimation to determine the differences in unrelated deal activity and expenditures between dividend-paying and share-repurchasing firms after the 2003 tax reform. We measure unrelated (related) M&A activity three different ways. First, we build a panel of firm-year data and create a binary indicator variable that equals one if a firm performs an unrelated (related) deal in that firm-year, and zero otherwise. Second, we also create a variable that captures the log of the total amount

of money a firms spend on unrelated (related) M&A each year, and finally, we create a variable that captures the log of the average deal value in a given firm-year.

We run separate estimations with either the unrelated or related variable being the dependent variable. Panel A of Table 4 displays these results comparing dividend-paying and share-repurchasing firms. The negative and statistically significant coefficients in Columns (1), (3), and (5) suggest that dividend-paying firms reduced their unrelated M&A activity more than did share-repurchasing firms after the 2003 tax reform. Columns (2), (4), and (6), however, show that dividend-paying and share-repurchasing firms had similar changes in related M&A activity. If we run this same difference-in-differences specification to assess the effect on dividend payouts, we find that dividend-paying firms significantly increased their dividend payouts in the post-2003 period, relative to share-repurchasing firms. This result aligns with the findings of Chetty and Saez (2005) and supports the notion that dividend-paying firms decreased their unrelated M&A activity after the 2003 tax reform and likely used their excess cash to pay out more in dividends.

C. CEO Risk-Taking Incentives

Lin, Officer, and Shen (2018) consider how managerial risk-taking incentives affect investment decisions across three types of mergers: vertical, horizontal, and diversifying. They find that vertical mergers reduce risk, while horizontal and diversifying deals do not, and they show that CEOs with high inside leverage are more likely to pursue vertical M&A. Our evidence pertains to that of Lin et al. (2018) but differs in three significant dimensions. First, we investigate how personal taxes interact with CEO risk-taking incentives to affect merger and acquisition decisions, which is new to the literature. Second, we use a different measure of exposure to risk, CEO vega. Third, unlike Lin et al. (2018), we find that CEO risk expo-

sure *does* have an impact on the quality of the unrelated—i.e., diversifying—M&A deals that CEOs pursue.

Taken together, our theoretical model and empirical results add to a literature on taxation and mergers and acquisitions (Ayers et al., 2002; Huizinga and Voget, 2009; Feld et al., 2016). These papers focus on the incidence of taxes triggered by acquisitions (Huizinga et al., 2012) and how capital gains taxes can distort acquisition financing decisions (Ayers et al., 2003, 2004). We contribute to this literature by showing how personal taxes can affect the risk-taking of CEOs in their merger and acquisition decisions.

VI. Conclusion

This paper proposes and finds supportive evidence for a new explanation of unrelated acquisitions based on tax distortions. One of the key implications is that the existence of unrelated acquisitions is not necessarily evidence of agency problems. In fact, the trapped equity explanation is consistent with managers acting purely to maximize shareholder value, net taxes. While unrelated acquisitions are not necessarily evidence of agency problems, they may be evidence of large distortions in the efficient allocation of capital due to tax policy.

We provide a theoretical model that incorporates unrelated acquisitions, risk-related agency problems, and dividend taxation. These features produce several novel findings and predictions. First, the model demonstrates that dividend taxes provide an incentive for managers, acting on behalf of shareholders, to undertake unrelated mergers to free trapped equity. The incentive to undertake unrelated mergers due to the trapped equity channel increases as the dividend tax rate increases. Second, despite the unambiguous effect of the dividend tax rate on trapped equity, the overall effect of the dividend tax rate on unrelated acquisitions is the-

oretically ambiguous. The ambiguous results occurs because of a countervailing interaction between the dividend tax and risk-related agency problems. Specifically, risk-related agency problems encourage more unrelated acquisitions, however, the dividend tax decreases these agency problems. Therefore, it is an empirical question whether increasing the dividend tax rate will cause more or less unrelated acquisitions.

Empirically, we find that the trapped equity effect is large and that increases in the dividend tax rate causes more unrelated acquisitions. This finding suggests that dividend taxes are distorting the allocation of capital through mergers and acquisitions. This finding also suggests that unrelated mergers may not necessarily indicate agency problems. We use a difference-in-differences framework around the 2003 tax reform to estimate these effects, and we also consider the interactive effect of CEO compensation convexity and effective ownership. To our knowledge, this paper is the first to specify and estimate the interactive, distortionary effects of CEO compensation structure and personal taxes on corporate investment policy. Our work builds on prior studies that consider executives' risk incentives, including Guay (1999), Coles et al. (2006), and Lin et al. (2018).

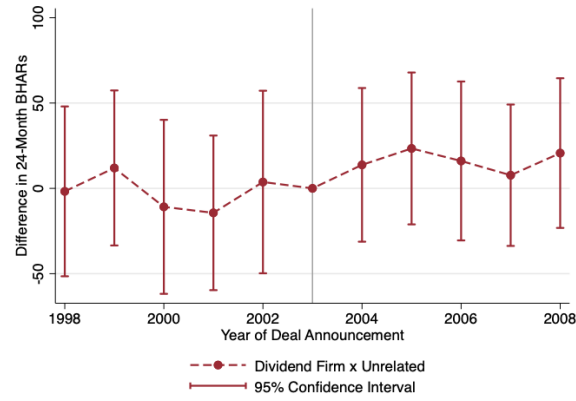
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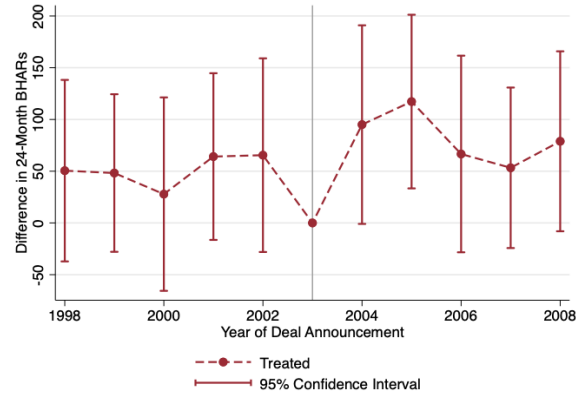
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(a) Return Trends to Unrelated M&A by Payout Type



(b) Return Trends to Unrelated M&A by CEO Vega



(c) Return Trends to Unrelated M&A by CEO Delta

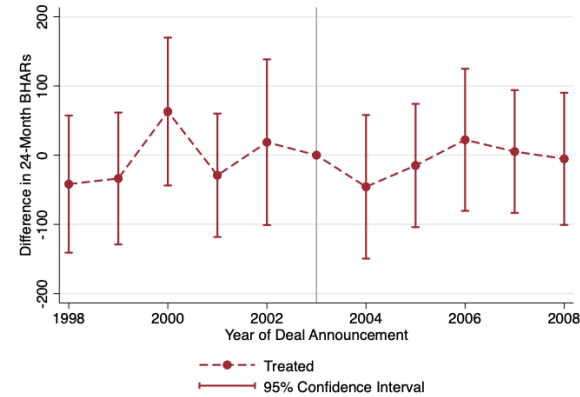


Figure 1: These figures plot the coefficients from estimations of Equation (13), used to assess common trends in the pre-2003 period. We perform tests of joint equality in the pre-2003 period and estimate the following p-values: 0.8179, 0.7139, and 0.2568 in Figures (a), (b), and (c), respectively.

Table 1
Summary Statistics

	Mean	Std Dev	Median	Obs
<i>24-Month BHAR</i>				
All Firms	-13.450	82.898	-20.098	5,553
Dividend-Paying	-16.109	84.037	-21.982	2,699
Share-Repurchasing	-10.936	81.742	-18.356	2,854
<i>Deal Relatedness</i>				
Unrelated	36.4%	48.1%	0	5,553
Related	63.6%	48.1%	1	5,553
<i>Deal Details</i>				
Transaction Value (mil.)	185.878	987.967	25.993	3,390
<i>Risk-Taking Incentives</i>				
CEO Vega	189.061	550.099	53.523	1,147
CEO Delta	1623.457	6582.994	292.305	1,111
<i>Controls</i>				
Ln(Assets)	5.799	1.817	5.782	5,553
Return on Assets	-0.031	0.589	0.053	5,553
Debt Ratio	0.214	0.216	0.170	5,553
Cash Flow	-0.063	10.39	0.476	5,553
Financial Distress	1.670	1.441	1.699	5,553

Notes: The deal-level data consists of 5,553 deals from 1998 to 2008, excluding deals announced in the year of the tax reform (2003). 24-Month BHARs are calculated with CRSP daily return data using the Fama-French 3-factor model. Dividend-paying firms are those that pay dividends from 1998 to 2002, but do not repurchase shares. Share-repurchasing firms are those that repurchase shares from 1998 to 2002, but do not pay dividends. Unrelated deals are those that are neither vertical nor horizontal, which are group together as Related deals. All variables are defined in Table A.1.

Table 2
Empirical Tests of Propositions

	Payout Policy		CEO Vega		CEO Delta		CEO Delta	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-2003 × Unrelated × Dividend Firm	17.565** (2.039)	17.504** (2.000)						
Post-2003 × Unrelated × High Vega			34.225** (2.151)	35.879** (2.187)				
Post-2003 × Unrelated × Low Delta					4.195 (0.260)	2.554 (0.157)	52.346** (2.293)	45.197* (1.929)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Level Effects	✓	✓	✓	✓	✓	✓	✓	✓
Diff-in-Diff Effects	✓	✓	✓	✓	✓	✓	✓	✓
Dividend-Paying Subset			✓	✓	✓	✓	✓	✓
High CEO Vega Subset							✓	✓
Entropy Balanced		✓		✓		✓		✓
Adj. R-Square	0.031	0.032	0.054	0.053	0.055	0.049	0.060	0.053
Observations	5,553	5,553	1,164	1,111	1,142	1,111	609	596

Notes: To test our propositions, we implement triple-differences estimations, using time variation before and after the 2003 tax reform and variation in the types of deal pursued—related versus unrelated—in the payout strategies employed—dividend-paying versus share-repurchasing—and in the risk-taking incentives of CEOs—high versus low CEO vega and delta. We use 24-Month BHARs as the dependent variable in all specifications, and we estimate variants of Equation (14) to consider each proposition in turn. Columns (1) and (2) use the full sample of M&A. Columns (3)–(8) restrict the sample to only dividend-paying firms, and Columns (7) and (8) further restrict the sample to only acquirers with high CEO vega. All specifications include controls for firm size, return on assets, debt ratio, cash flow, and financial distress. Level effects and difference-in-differences effects are included in all specifications as well, but we suppress the output for brevity. Robust standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

Table 3
Sensitivity Analysis

Panel A: Payout Types		All Deals				
	(1)	(2)	(3)	(4)	(5)	(6)
Post-2003 \times Unrelated \times Dividend Firm	17.565** (2.039)	17.565** (2.800)	15.178** (3.126)	13.604** (2.799)	14.119*** (3.217)	15.285*** (3.335)
Adj. R-Square	0.031	0.031	0.037	0.035	0.035	0.038
Observations	5,553	5,553	5,553	6,015	6,015	5,553
Panel B: CEO Vega		All Deals				
	(1)	(2)	(3)	(4)	(5)	(6)
Post-2003 \times Unrelated \times High Vega	34.225** (2.151)	34.225** (2.740)	32.407** (2.478)	22.031 (1.431)	39.033** (2.690)	34.027** (2.468)
Adj. R-Square	0.054	0.054	0.057	0.060	0.063	0.058
Observations	1,164	1,164	1,164	1,242	1,242	1,111
Panel C: CEO Delta		All Deals				
	(1)	(2)	(3)	(4)	(5)	(6)
Post-2003 \times Unrelated \times Low Delta	4.195 (0.260)	4.195 (0.191)	6.137 (0.284)	8.128 (0.391)	3.262 (0.162)	4.092 (0.177)
Adj. R-Square	0.055	0.055	0.058	0.061	0.060	0.054
Observations	1,142	1,142	1,142	1,219	1,219	1,111
Panel D: CEO Delta (High Vega)		All Deals				
	(1)	(2)	(3)	(4)	(5)	(6)
Post-2003 \times Unrelated \times Low Delta	52.346** (2.293)	52.346** (2.286)	47.989* (2.039)	45.630* (1.979)	43.639* (1.918)	39.417 (1.626)
Adj. R-Square	0.060	0.060	0.073	0.072	0.077	0.068
Observations	609	609	609	659	659	596
Controls	✓	✓	✓	✓	✓	✓
Robust SEs	✓					
Cluster SEs by Firm & Year		✓				
Cluster SEs by Year			✓	✓	✓	✓
Include Year FEs			✓	✓	✓	✓
Include 2003 Deals as Post-2003				✓		
Include 2003 Deals as Pre-2003					✓	
Entropy Balanced						✓

Notes: The results in this table assess the robustness of our results. Column (1) in Panels A, B, C, and D restate the results from Columns (1), (3), (5), and (7), respectively, of Table 2. In Column (2), we cluster the standard errors by firm and year, whereas Column (1) used robust standard errors. In Column (3), we cluster the standard errors by year only and include year fixed effects into the model. Columns (4) and (5) include deals announced in 2003, the year of the tax reform, into either the post-2003 or pre-2003 period, respectively. Finally, Column (6) again implements entropy balancing, but in a model that includes year fixed effects. All specifications include controls for firm size, return on assets, debt ratio, cash flow, and financial distress. Level effects and difference-in-differences effects are included in all specifications as well, but we suppress the output for brevity. Robust standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

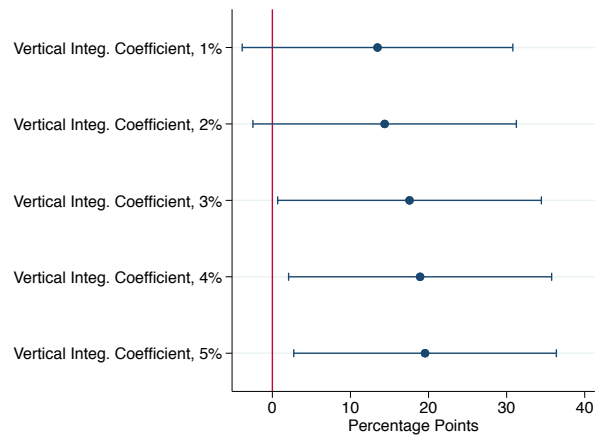
Table 4
Effects of Taxes on M&A Activity and Deal Returns

	Deal Likelihood (Logit)		Log(\$Millions per Year)		Log(\$Millions per Deal)	
	Unrelated Deals	Related Deals	Unrelated Deals	Related Deals	Unrelated Deals	Related Deals
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Firm \times Post-2003	-0.532*** (-3.634)	-0.075 (-0.627)	-0.853*** (-3.544)	-0.230 (-0.712)	-0.836*** (-3.504)	-0.202 (-0.633)
Level Effects	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
Pseudo/Adj. R-Square	0.0180	0.0299	0.012	0.035	0.012	0.035
Observations	8,891	8,891	8,891	8,891	8,891	8,891

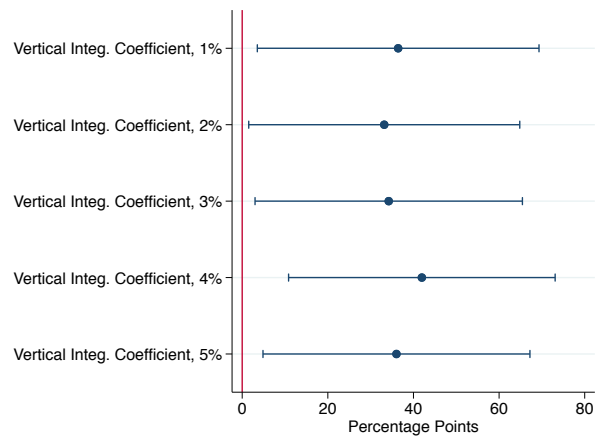
Notes: In this table, we estimate difference-in-differences estimations on a panel of firm-year data. In Columns (1) and (2), we run logistic regressions, using as the dependent variable a binary indicator variable that equals one if a firm performs an unrelated related deal in that firm-year, and zero otherwise. In Columns (3) and (4), we run ordinary least squares regressions, with the dependent variable being the log of the total amount of money a firms spend on unrelated and related M&A each year, respectively. In Columns (5) and (6), the dependent variable is the log of the average unrelated and related deal value, respectively, in a given firm-year. All specifications include year fixed effects and controls for firm size, return on assets, debt ratio, cash flow, and financial distress. Level effects are included in all specifications as well, but we suppress the output for brevity. Robust standard errors are reported in parentheses. Statistical significance of 10%, 5%, and 1% is denoted by *, **, and ***, respectively.

A. Appendix

(a) Sensitivity of Payout Results



(b) Sensitivity of CEO Vega Results



(c) Sensitivity of Delta Results

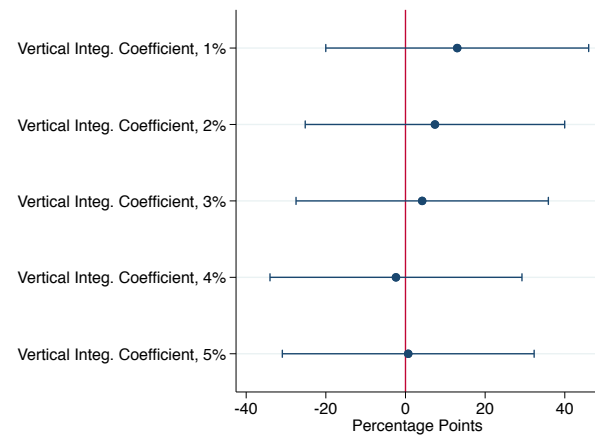


Figure A.1: These figures show the robustness of our main results to the use of different vertical integration coefficients.

Table A.1
Variable Definitions

Variable	Definitions	Source
Related Deal	We use the input-output (I/O) data from the Bureau of Economic Analysis (BEA) to construct a measure of vertical relatedness between any two industries. We categorize an acquisition as vertical if the vertical relatedness coefficient between the acquirer and target is larger than 3%. Lin et al. (2018) use thresholds of both 1% and 5%, so we perform our main analysis using the mid-point between these two thresholds. We classify an acquisition as horizontal if the acquirer and target share the same two-digit SIC code and do not meet the threshold for a vertical relation. We group vertical and horizontal mergers as related.	SDC
Unrelated Deal	We classify deals that are neither vertical nor horizontal as unrelated.	SDC
Post	Equal to one if the deal is announced in 2003, and zero otherwise.	SDC
High (Low) CEO Vega	We partition the sample of deals into high versus low CEO vega based on whether the acquiring firm has CEO vega that is above or below the median value relative to other firms in its same industry in the year of the deal, using the average of time t and $t-1$ values.	Execucomp
High (Low) CEO Delta	We partition the sample of deals into high versus low CEO delta based on whether the acquiring firm has CEO delta that is above or below the median value relative to other firms in its same industry in the year of the deal, using the average of time t and $t-1$ values.	Execucomp
Dividend-Paying Firm	We classify an acquiring firm as dividend-paying if, from 1998–2002, the firm made dividend payments but did not perform repurchase shares.	Compustat
Share-Repurchasing Firm	We classify an acquiring firm as share-repurchasing if, from 1998–2002, the firm repurchased shares but did not make dividend payments.	Compustat
Firm Size	We use the two-year average value (i.e., average of time t and $t-1$ values) of the natural log of the firm's total book assets.	Compustat
Return on Assets	We use the two-year average value (i.e., average of time t and $t-1$ values) of the firm's income before extraordinary items divided by its total book assets at the start of the year.	Compustat
Debt Ratio	We use the two-year average value (i.e., average of time t and $t-1$ values) of the firm's total long-term debt and current liabilities divided by its total book assets.	Compustat

Variable Definitions (continued)

Variable	Definitions	Source
Cash Flow	We use the two-year average value (i.e., average of time t and $t-1$ values) of the firm's income before extraordinary items and depreciation/amortization divided by its total net book value of property, plant, and equipment at the start of the year.	Compustat
Financial Distress	We use the Hadlock and Pierce (2010) approach to measure financial distress. Financial distress is calculated as $(-0.737 \times \text{Size}) + (0.043 \times \text{Size}^2) - (0.040 \times \text{Age})$, where Size is the log of inflation adjusted (to 2004) book assets, and age is the number of years the firm has been on Compustat with a non-missing stock price. In calculating this index, size is replaced with $\log(\$4.5 \text{ billion})$ and age with thirty-seven years if the actual values exceed these thresholds. We then consider the average of time t and $t-1$ values.	Compustat

Notes: This table describes the construction and source of each variable used in our empirical analysis.