Managerial Ownership and Firm Performance: Evidence From the 2003 Tax Cut *

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Abstract

Empirical evidence on the causal effects of managerial ownership on firm performance has been elusive due to a lack of within-firm variation and credible empirical design. This paper identifies this causal effects exploiting the 2003 Tax Cut as a quasi-natural experiment, which increased the net-of-tax effective managerial ownership. Consistent with predictions from agency theory, our difference-in-difference empirical design uncovers a significant and hump-shaped improvement in firm performance measured by Tobin's Q with respect to the level of managerial ownership due to the tax cut. Moreover, the increase in performance is more pronounced for firms where agency problems are relatively more severe as well as firms under weak alternative governance mechanisms, further demonstrating a rise in managerial ownership incentive being the underlying channel for our results. Our results are robust to examination of pre-trend and placebo tests, accounting measures of firm performance as well as other considerations.

Keywords: Firm valuation; Director and officer ownership; Corporate Governance; Institutional ownership concentration

JEL Classification: G34 G32 D86

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1 Introduction

The conflict of interests between principals and agents in modern corporations has intrigued economists for a long time. To mitigate this problem, classic works in agency theory such as Jensen and Meckling (1976) propose use of equity holdings of the firm instead of cash compensation to better align the interests between managers and shareholders. Despite the theoretical and practical importance, convincing empirical evidence has been elusive and consequently there is a lack of consensus on whether managerial ownership matters for firm performance. On the one hand, works such as Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990) and Hermalin and Weisbach (1991) document significant non-linear relations between insider ownership and firm performance in the cross-section. On the other hand, Demsetz and Lehn (1985), Loderer and Martin (1997), Himmelberg, Hubbard, and Palia (1999), among others, question the interpretation of the cross-sectional results as causal evidence for the effect of managerial ownership on firm performance.

A key empirical challenge originally raised by Demsetz (1983) and Demsetz and Lehn (1985) is the endogeneity problem caused by omitted variables. Managerial ownership is not randomly assigned across different firms; on the contrary, it is endogeneously affected by the firm-specific contracting environment[1]. Himmelberg, Hubbard, and Palia (1999) propose to use firm fixed effect in a panel data framework and focus on the within-firm variation instead of across-firm cross sectional variation. They fail to find a statistically significant association between managerial ownership and firm performance. However, in a comment to their article, Zhou (2001) argues that for most companies, there is very little within-firm variation in the managerial ownership. Small year-by-year innovations in ownership are unlikely to cause substantial shifts in managerial incentive and subsequent within-firm changes in performance. Relying only on within-firm variation may lack the statistical power to identify any effect, even if it exists.

[1]Other related works include Kole (1996), Agrawal and Knoeber (1996), Cho (1998) and Demsetz and Villalonga (2001). However, the efficient contracting view is questioned by another strand of literature that view incentive contracts often captured by the management team, in particular CEO. Bebchuk and Fried (2006) survey the literature on inefficient contracting inside the firm.

This paper overcomes these empirical challenges in the literature by exploiting the 2003 Tax Cut in the US that created an abrupt change in the net-of-tax effective managerial ownership in a quasi-natural experiment design. The Jobs and Growth Tax Relief Act of 2003 (commonly known as the 2003 Tax Cut) reduced the highest statutory dividend tax rate from 35% to 15% (Chetty and Saez (2005, 2010)). With rational managers trading-off private benefit with higher firm value, a higher net-of-tax value accruing to managers from their equity holdings of the firm due to tax cut is isomorphic to raising managers' ownership stake.

The 2003 Tax Cut provides an ideal setting to examine the causal relationship between higher managerial ownership incentive and firm performance. One can think of the tax cut as a quasi-natural experiment, as the dividend tax proposal appears to have been largely unanticipated to the market (Auerbach and Hassett (2006)). More importantly, the 2003 Tax Cut creates differential increase in managers' effective ownership across firms: how the firm has been affected depends crucially on its predetermined managerial ownership in 2002. Intuitively, when managers own close to zero share of the firm, their incentive will not be changed much by the tax cut. Therefore we should not expect a large change in performance for these firms. Firms with very high managerial ownership already have managers' interests well-aligned with shareholders' and will likely not to display large change in performance either. At the same time, firms with intermediate level of managerial ownership could respond strongly to the tax cut, as the tax cut greatly increases their marginal benefit of firm-value enhancing behaviors. These features enable us to examine the increased managerial incentive through higher effective ownership stake on firm value by employing a difference-in-difference empirical strategy.

Our results show that by boosting managerial ownership incentive, the 2003 Tax Cut significantly increased firm performance as measured by Tobin's Q. In our sample, the asset-weighted average of managerial ownership defined as the ratio of equity owned by all directors and officers is 6 percentage points. Based on our model estimates, it implies that on average the rise in managerial incentive leads to an around 5% increase in Tobin's Q from 2000 to 2005. Results from

both non-parametric and parametric specifications detect a hump-shaped improvement in firm performance: it is larger for firms with intermediate managerial ownership while smaller for firms with very small or large managerial ownership. This is consistent with predictions from a stylized agency model following Chetty and Saez (2010). We also demonstrate that our results are not driven by pre-existing differential trends in firm performance before the 2003 Tax Cut took place. When conducting two placebo tests in which we treat 1999 and 2000 as two separate years of placebo tax cut, we fail to replicate the main results. These results strongly support our identifying assumption that firms with different levels of managerial ownership would not have evolved *differentially* without the 2003 Tax Cut and therefore the validity of our empirical strategies.

We also uncover that the change in firm performance varies systematically with several different proxies for the agency problem between managers and outside shareholders. As agency problem is likely to rise from moral hazard or informational asymmetry inside the firm, our proxies include: R&D intensity for opaqueness of the firm (Aboody and Lev (2000)), cash holding for free cashflow (Chava and Roberts (2008)) and stock idiosyncratic volatility for informational asymmetry (Moeller, Schlingemann, and Stulz (2007)). We find economically and statistically significantly more pronounced effect of the tax cut on firm performance for firms subject to more severe agency problem.

To strengthen our interpretation that the 2003 Tax Cut increased firm performance by providing higher incentive for managers, we examine how firm managerial ownership, as a governance mechanism, interacted with other channels of corporate governance. More specifically, we divide firms into strong and weak governance sub-samples and repeat our empirical exercise as before in both sub-samples. The first governance mechanism we examine is firm's anti-takeover strength proxied by G-index (Gompers, Ishii, and Metrick (2003)) or E-index (Bebchuk, Cohen, and Ferrell (2009)). Firms with strong anti-takeover protection appear to underperform as they protect entrenched managers against the correcting force from capital market [2]. The second governance

[2]Bebchuk, Cohen, and Wang (forthcoming) find the correlation of stock return and these governance indexes only

mechanism is concentrated institutional ownership, which is measured by shares of top-5 largest institutional holders. Works such as Shleifer and Vishny (1986), Bertrand and Mullainathan (2000), Hartzell and Starks (2003), Cremers and Nair (2005), Edmans (2009), and Edmans and Manso (2011) demonstrate blockholders and institutional investors have nonnegligible influence in governing firm policies. We also consider firm leverage, as theoretical literature argues a higher leverage ratio could help reduce the agency problem induced by free cashflow and discourage managers to enjoy the quiet life (Jensen (1986); Zwiebel (1996)).

Our results show that in general, managerial ownership as a governance mechanism, substitutes with other channels of corporate governance. Only firms under weak internal corporate governance proxied by higher anti-takeover index have a significant and hump-shaped effect from the 2003 Tax Cut. We also uncover a more pronounced effect due to the tax cut for firms with weaker blockholder governance and lower leverage. It is worth emphasizing that these results strongly support the underlying channel for the increase in firm performance being a higher managerial incentive. Firms with weak corporate governance leaves room for agency problems and at the same time opportunity to improve firm performance when managerial interests have been better aligned with shareholders' due to tax cut. Before showing these results, one could be concerned that the effects we identified are confounded by the rise in firm value as a result of an increased interest in the market for corporate control or concentrated institutional investors receiving stronger incentive in monitoring managers. Neither of these interpretations are consistent with our findings.

One could be concerned that our results are driven by other confounding macro shocks that coincided with the 2003 Tax Cut and the positive effects on firm performance also correlate with managerial ownership. This concern stems from the fact that managerial ownership is correlated with firm characteristics such as firm size and age. To guard against this serious concern, we employ three approaches to strengthen our results. First, we fully saturate our model with 3-digit

occurred during 1991-1999, but did not persist from 2000-2008. They also provide evidence this is due to market participants' learning. However, they find the negative association between these indexes and Tobin's Q or operating performance persisted.

industry by year dummies and find little change in results which are identified net of time-varying industry-specific shocks. Second, we choose matched firms based on firm characteristics such as size, age, investment and industry and show this subsample of matched firms also display patterns in our Diff-in-Diff empirical design similar to main results. Third, we use Canadian firms in Compustat to do a placebo test and find no significant treatment effects in this sample. If one is willing to accept that Canadian firms share similar macro shocks as US firms, then the null results are at odds with the confounding macro shocks story. Moreover, we show that US firms matched to the characteristics of these Canadian firms are affected similarly as our full sample. This set of empirical analyses strongly reject confounding macro shocks as the underlying drivers of our results.

We also conduct a battery of other robustness tests. First, we confirm our results are robust when we measure our dependent variable in log instead of the raw value. Second, we add extra controls for dividend issuance in our empirical model[3]. We include controls for the amount of dividend yield and indicator of dividend issuance and find our results are not affected by the consideration of dividend issuance. Third, we isolate a sub-sample of firms whose largest institutional investor is not affected by the 2003 Tax Cut and find similar patterns as the whole sample. It demonstrates that our results are not driven by an increased incentive from institutional investors. Fourth, we confirm the robustness of our results allowing for more flexible structure in the serial correlation of error terms using bootstrap or two-way clustering by firm and year. We also examine alternative measures of firm operating performance: operating return on asset (OROA), return on asset (ROA), net profit margin (NPM) and return on equity (ROE). While these firm level measures of performance are not in the center of debate in the literature, they add to the support of our main findings. We again find similar effects using these measures as proxy for firm performance.

To better understand our results, it is useful to compare our research design with an experiment

[3]As documented by Chetty and Saez (2005), the 2003 Tax Cut induced an abrupt increase in dividend payout and firms with higher managerial ownership issued more dividends.

where managerial ownership is randomly assigned across firms. For the sake of investigating the effect of increased managerial incentive brought about by a higher effective ownership stake, the two research designs are quite similar. However, as our quasi-natural experiment does not involve an accompanying increase in control or voting right[4], the hump-shaped effect that we detect is not due to managerial entrenchment argued by earlier literature (for example, Stulz (1988)) while the random assignment design could account for these aspects. Our empirical exercise could be best thought of as testing the effect from higher ownership incentive as predicted by a standard agency theory model (for example, Jensen and Meckling (1976)). In this sense our research design is cleaner than the random assignment design, as our research design does not pick up the effect from higher managerial ownership due to entrenchment.[5] It is also worth making the distinction that we identify the *change* in firm performance displays a hump-shaped manner with respect to managerial ownership while the literature often discusses the 'hump-shaped' relationship in the *cross section* of firms.

A considerable literature has examined the relationship between managerial ownership and firm performance both theoretically and empirically [6]. This paper is in similar spirit with some relatively recent works that have turned to examine evidence from relatively sharp change in managerial ownership to sidestep the lack of within-firm variation issue raised by Zhou (2001). Notable examples include Core and Larcker (2002) and Fahlenbrach and Stulz (2009). Core and Larcker (2002) find increase in stock return and ROA for 195 firms that adopt 'target ownership plans'. Fahlenbrach and Stulz (2009) examine a sub-sample of firms that have seen large change (>2%) in

[4]Volpin (2002) and Atanassov and Kim (2009) find top managers with or are connected with substantial ownership stake are less likely than those without to be dismissed in face of poor firm performance.

[5]At the same time, our results are only suggestive for policy recommendation for exactly the same reason. More specifically, our empirical design captures the net effect of alignment of interests effect and risk-aversion effect, and we call this net effect the incentive effect. It is also worth noting that even the ideal experiment can not separate the alignment of interests effect from risk-aversion effect.

[6]See Holderness, Kroszner, and Sheehan (1999), Anderson and Reeb (2003), Adams and Santos (2006), McConnell, Servaes, and Lins (2008) for examples of recent works. Also see Coles, Lemmon, and Felix Meschke (2012) for a structural investigation in this literature. In particular, they show that due to the endogenous nature of the variables of interest, using an instrumental variable approach may find a spurious relationship that does not exist in the true structural model.

managerial ownership and conclude that increases in shares held by officers are related to increase in Tobin's Q.

Our empirical design has a number of advantages. While notable within-firm variation in managerial ownership has been only available in particular contexts and remain elusive in the large sample, the 2003 Tax Cut is applied to virtually all public firms in the US. Compared with existing literature that looks at actual change in firm managerial ownership spanning a long period, we focus on a relatively short window and could alleviate the concern about changes in unobservables at the firm level. Our quasi-natural experiment also avoids many complications involved in direct change in managerial ownership [7] . We are also able to employ standard econometric approaches to examine issues such as pre-determined trend and do falsification tests to deal with endogeneity concerns. Our paper therefore joins a growing stream of literature in empirical corporate governance that estimates causal effects by exploiting quasi natural experiment settings for identification. For example, see works of Bertrand and Mullainathan (2003), Cuñat, Gine, and Guadalupe (2012) and Bharath, Jayaraman, and Nagar (2013).

Our paper is hopefully able to reconcile the two strands of works in the literature. On the one hand, our difference-in-difference empirical design embodies the fixed effects framework in Himmelberg, Hubbard, and Palia (1999) to control for firm-specific contracting environment and our use of 2003 Tax Cut addresses the lack of within-firm variation problem pointed out by Zhou (2001). On the other hand, our results support the view such as Jensen and Meckling (1976) and Morck, Shleifer, and Vishny (1988) that managerial ownership significantly affects firm performance.

Our work also contributes to research that examines how different governance mechanisms interact with each other within the broad corporate governance literature. Giroud and Mueller (2010,

[7]Changes in managerial ownership have been found to be associated with large changes in ownership at the same time (Denis and Sarin (1999)).For example, a retiring CEO with a substantial ownership stake could sell shares upon retirement. Fahlenbrach and Stulz (2009) find firms experiencing a large drop in managerial ownership are more likely to have a concurrent change in CEO or in the board chairman.

2011) demonstrate that firms with weak corporate governance from anti-takeover aspect performed worse only in non-competitive industries. Kim and Lu (2011) find a hump-shaped relationship between CEO ownership and firm valuation only in firms of high external governance as measured by strong product market competition or high institutional ownership. While these works suggest substitution effects of different governance channels in mitigating agency problems, some works reveal complementary relationship as well: Cremers and Nair (2005) find firms with good corporate governance proxied by low anti-takeover index out-perform weak governance firms only with high blockholder ownership. We add to this literature by providing a convincing causal evidence of substitution relationship between managerial ownership and several alternative channels of governance mechanisms proxied by anti-takeover index[8], institutional blockholding and leverage.

Our paper builds on the works of Chetty and Saez (2010) and Cheng, Hong, and Shue (2013). Chetty and Saez (2010) first conceptualize the 2003 Tax Cut as an exogenous change in managerial ownership incentive due to increase in net-of-tax effective ownership stake. Cheng, Hong, and Shue (2013) apply this idea in an empirical context to argue that firm's corporate social responsibility (CSR) behavior is due to managerial agency problems and they find the 2003 Tax Cut caused firms with intermediate levels of top-5 executive ownership cut CSR spending most. For our purposes, Cheng, Hong, and Shue (2013) demonstrate a concrete channel through which the 2003 Tax Cut increased managerial incentive and subsequent improvement in firm performance [9].

This paper is organized as follows. Section 2 discusses the background of the 2003 Tax Cut and implications from a stylized model. Section 3 describes data and our empirical design. Section 4 presents our main results on the managerial ownership and firm performance, our diagnostic tests

[8]Kim and Lu (2011) argue that the anti-takeover provisions are firm choice variables and do not investigate this interactive relationship due to concerns of endogeneity. We are able to examine this relationship as our empirical design uses the 2003 Tax Cut, an exogenous shock to firms.

[9]There is another major difference between our paper and Cheng, Hong, and Shue (2013). While Cheng, Hong, and Shue (2013) focus on demonstrating CSR is a particular form of agency problems, we are not only interested in whether a differential improvement in firm performance occurs, but also the particular channel through which firm performance improves. If change in firm performance is mainly driven by other governance channel, not managerial ownership, then we cannot argue for the causal relationship between managerial ownership and firm performance.

for pretrend and placebo tests, robustness tests against confounding macro shocks concern as well as the heterogeneity results on firm agency issue. Section 5 demonstrates the interactive effects of managerial ownership and other governance channels. Section 6 presents other robustness checks to our main results. Section 7 concludes.

2 Background, stylized model and implications

2.1 The 2003 Tax Cut

The Jobs and Growth Tax Relief Reconciliation Act of 2003 was signed into law by President George W. Bush on May 28, 2003. The tax reform has been proposed in early January and was applied retroactively from January 1st, 2003. The main provisions of the act is to reduce the highest statutory dividend tax rate from 35% to 15%. The substantial cut in dividend tax is regarded in the literature to have been largely unanticipated to the market (Auerbach and Hassett (2006)). Auerbach and Hassett (2006) also show the market expects the tax cut to be permanent. Chetty and Saez (2005) find it has led to a sharp increase in corporate dividend payout. The literature observes the cut in tax rate reduced firms' cost of equity (Dhaliwal, Krull, and Li (2007)), lowered firms' leverage ratio (Lin and Flannery (forthcoming)) and was associated with higher overall equity prices (Auerbach and Hassett (2005, 2006)). Chetty and Saez (2010) interpret this stylized finding in a simple principal-agent model where the manager trades off private benefits from control right against net-of-tax benefits from cashflow right as a shareholder. A reduction in tax rate will work as if the manager has higher effective ownership in her cashflow right while not change the private benefits from control right. Thus the manager has higher incentive to choose either productive investment or higher dividend issuance to align her interests with that of other shareholders.

2.2 A Stylized Model and Empirical Implications

Here we adopt a similar model from Chetty and Saez (2010) to illustrate the mechanism of the 2003 tax cut. This stylized two-period model has also been used similarly in Cheng, Hong, and Shue (2013).

At period 0, the representative manager can allocate firm's cash Γ among three alternatives uses: invests K in productive project, spends J in less productive investment or pays out dividend D at period 0. In particular, the return from all investment in period 1 will be $f(K) + K + J$ and manager obtains private benefit from the less productive investment $g(J)$. We assume that $f(.)$ and $g(.)$ are positive, strictly increasing and concave functions, with $g(0) = 0$. The time discount rate is r.

We denote the fraction of managerial ownership as α and given the lack of within-firm variation in the data, we treat it constant over time. Effective managerial ownership stake ω is represented as the residual share of payouts from equity holdings of the firm accruing to the manager, which equals $\alpha(1-\tau)$, where τ is the tax rate. The manager trades off her private benefit from the control right against her own stake in the dividend payout and value of the firm from cashflow right, under the budget constraint that $\Gamma = K + J + D$. More specifically the manager solves,

$$\max_{K,J,D} \alpha(1-\tau)\left(D + \frac{f(K) + K + J}{1+r}\right) + \frac{g(J)}{1+r}$$

Denote the pre-2003 tax rate as τ_{pre} and the after-2003 tax rate as τ_{post}, the 2003 Tax Cut leads to a fall in the tax rate in our simple model $\tau_{post} < \tau_{pre}$, or equivalently an increase in effective ownership stake $\omega_{post} > \omega_{pre}$. Denote the period-1 firm value under pre-2003 tax rate as $F(K_{pre}) = f(K_{pre}) + K_{pre}$ and that under after-2003 tax rate as $F(K_{post}) = f(K_{post}) + K_{post}$. As manager's marginal cost of private benefit increases, we expect an increase in firm value, *ceteris paribas*. Under some reasonable assumptions, one could derive the following predictions regarding the effect of the 2003 Tax Cut on firm value.

Prediction 1. Lower value of the tax rate τ, or equivalently, a higher value of effective net-of-tax ownership stake ω, leads to an increase in firm value $F(K)$: $F(K_{post}) - F(K_{pre}) > 0$, *ceteris paribas*.

Prediction 2. The increase in firm value, ie, $F(K_{post}) - F(K_{pre})$ is hump-shaped with respect to the pre-determined managerial ownership ratio, *ceteris paribas*.

Conditions and derivations for the two predictions are in the appendix. We provide a brief intuitive illustration as to why a hump-shaped effect of increase managerial ownership on firm performance is consistent with theory. For firms with very low managerial stake, their incentive will not be altered much by the tax cut and subsequently the firm performance should change little. For firms with very high managerial stake, the interests of managers have been well-aligned with other shareholders, thus they already choose the behavior to maximize firm value, subject to the budget constraint. Firms with intermediate level of managerial ownership are exactly those that are most sensitive to change in tax rate, as the marginal benefit of choosing firm-value enhancing project is higher. Therefore, we would expect a hump-shaped treatment effect from the 2003 Tax Cut in the cross section.

We also want to note that in general, economic theory predicts three major channels managerial ownership could affect firm performance. The first effect, we call alignment of interests effect, is that higher managerial ownership will align the interests between managers and shareholders as the marginal benefit of firm-value enhancing behavior is increasing with managerial ownership. The second effect, we call risk aversion effect, demonstrated in literature of optimal contracting, is that a higher managerial ownership will expose the manager to idiosyncratic risk of the firm and induce the manager to choose low-risk projects at the expense of firm value. This risk aversion effect is in general expected to be strong when the managerial ownership is high. A third effect, called entrenchment effect, refers to the fact that managers with large insider ownership could entrench themselves. This could manifest itself in the manager taking advantage of small shareholders and at the same time preventing the firm from being taken over by outsiders, even if the firm is not

running efficiently.

In our empirical design, a tax cut will raise the effective managerial ownership while keep constant the associated control right of managers. Our stylized model captures the alignment of interests effect but is quiet on the risk aversion effect. However, the hump-shaped relationship of change in firm performance and managerial ownership is still consistent with our identified effect being the net effect of the alignment of interests effect, countervailed by the the risk-aversion effect. We also want to distinguish our 'hump-shaped' relationship, which is the *change* in within-firm performance with respect to the managerial ownership, with the 'hump-shaped' relationship in the literature, such as McConnell and Servaes (1990) and Stulz (1988), which is the cross-sectional relationship between the absolute firm performance and managerial ownership. The 'hump-shaped' relationship in the literature captures all of the alignment of interests effect, risk aversion effect and entrenchment effect. Since our empirical design does not involve an increase in voting power or control right endowed by equity ownership, we do not identify the countervailing effect due to entrenchment.

3 Data and empirical design

3.1 Data

We construct a panel of firms from 2000 to 2005, combining information from managerial ownership data in Compact Disclosure[10], accounting data in Compustat and stock return data from CRSP. While the earlier literature has used slightly different definitions of managerial ownership[11], more recent literature as well as the center of debate has used the aggregate percentage ownership of

[10]Compact Disclosure attempts to collect information on firms that have assets in excess of $5 million from their Securities and Exchange Commission (SEC) filings. It no longer provides data after 2005.

[11]For instance, Morck, Shleifer, and Vishny (1988) use the company's directors, and Demsetz and Lehn (1985) examine the ownership by the five or twenty largest shareholders of a corporation.

equity securities owned by all officers and directors of a company[12] [13]. We therefore adopt this definition of managerial ownership.[14]

We apply standard treatment in the literature to get our final sample of 15,846 firm-year observations for 3,690 different firms. We exclude utilities and financial firms, as well as firms that appear in the sample for less than three consecutive years. We require that our sample firms have no missing sales or total assets and end their fiscal year in December. We also exclude dual class firms[15].

Consistent with the literature, our main measure of firm performance is Tobin's Q, proxied by the ratio of market value of assets divided by the book value of assets, where the market value is calculated as the market value of common equity plus the estimated market value of preferred stock plus the book value of total liabilities. Following Gilchrist and Himmelberg (1995) and Almeida and Campello (2007), we eliminate firm-years with Q exceeding 10.0, as their Q is likely to be grossly mismeasured. To guard against the effect from outliers, we winsorize both variables at the 1st and 99th percentiles of their empirical distribution. We obtain similar results if we winsorize at the 5th and 95th percentiles or at the 10th and 90th percentiles, or if we use median quantile regressions instead.

[12]Examples include Himmelberg, Hubbard, and Palia (1999), Holderness, Kroszner, and Sheehan (1999), Zhou (2001), Helwege, Pirinsky, and Stulz (2007) and Fahlenbrach and Stulz (2009).

[13]The literature on managerial ownership and firm performance has focused on the Jensen and Murphy type measure of incentive, which is dollar change in wealth for a dollar change in firm value (Jensen and Murphy (1990)). Alternative measures of ownership incentive have been proposed by Hall and Liebman (1998): dollar change in wealth for a percentage change in firm value, and by Edmans, Gabaix, and Landier (2009): dollar change in wealth for a percentage change in firm value scaled by compensation.

[14]The earlier literature on managerial ownership and firm performance does not take options into account, probably because options was not a prevalent form of executive compensation at that time. Recent works such as Kim and Lu (2011) included options into the calculation of managerial ownership and they didn't find much explanatory power for options and their preferred results are exclusive of options. Consistent with Cheng, Hong, and Shue (2013), we here do not consider options for a number of reasons. As many options are not dividend protected, we are not able to determine an unambiguous effect from the dividend tax cut. Also, options instead of shares were granted to managers for reasons beyond aligning incentive, including favorable tax treatment, workaround for firm financial constraints, as well as accounting manipulation which received a lot of attention for the scandals in early 2000's (Lie (2005)). Therefore firms with more option grants could have aggravated the agency problem instead of alleviated it.

[15]Anderson and Lee (1997) compared different sources of ownership data and found Compact Disclosure provides high quality data for single class firms, but there are considerable errors in voting ownership for dual class firms.

3.2 Empirical Model and Identification Strategy

Our main empirical strategy is to use a difference-in-difference approach by comparing performance of firms with relatively higher level of managerial ownership to firms with relatively lower managerial ownership before and after the 2003 Tax Cut. Our stylized model shows that firms with different level of managerial ownership are affected differentially, with a hump-shaped relationship between managerial ownership ratio and change in firm performance. Since the assignment of managerial ownership is clearly not random, our identification strategy relies on the assumption that, has the 2003 Tax Cut not taken place, the performance for firms with different level of managerial ownership would have evolved similarly. Even though we can not prove this identifying assumption, there are sufficient supporting evidence from the literature and provided by our results. On one hand, without enough within-firm variation in ownership, firms with higher managerial ownership do not seem to out-perform those with lower managerial ownership (Himmelberg, Hubbard, and Palia (1999), Zhou (2001)). On the other hand, we provide standard tests for pre-trend in Section 4.5 and find that before the 2003 Tax Cut, there is no clear association between managerial ownership and firm performance. In addition, when we regard year 1999 or 2000 as two separate placebo dates of 'Tax Cut' to conduct falsification tests in Section 4.6, we cannot replicate the results in our main regression.

More specifically, we estimate the following model[16]:

$$Q_{it} = \alpha_1 Share02_i * Post2003_t + \alpha_2 ShareSq02_i * Post2003_t + X_{it}\beta + Year_t + Firm_i + \varepsilon_{it}$$

where Q_{it} is Tobin's Q of firm i at year t, $Post2003_t$ is our treatment dummy that equals one for years after and including 2003. Consistent with existing literature that often finds a non-linear relationship, we interact the treatment dummy with both linear and quadratic terms of pre-determined managerial ownership ratio at year 2002, $Share02_i$ and $ShareSq02_i$. We include year fixed ef-

[16]Construction for all variables in our regressions is presented in Table 1.

fects $Year_t$ to absorb any economy-wide temporal shocks and firm fixed effects $Firm_i$ to control for firm-specific contracting environment, consistent with the approach in the literature following Himmelberg, Hubbard, and Palia (1999). We include a set of firm-level controls X_{it} to prevent omitted variable bias[17]. The full list of controls is presented in Table 4 along with our main regression. Following Bertrand, Duflo, and Mullainathan (2004), we cluster standard errors by firm to allow for heteroskedasticity across firms and within-firm serial correlation of error terms.

4 Results

4.1 Summary Statistics

We report summary statistics of all variables used in our study in Table 2 . In our sample, the mean and median of our measure of managerial ownership is 23.8% and 16.3%, which is similar to Himmelberg, Hubbard, and Palia (1999) and Fahlenbrach and Stulz (2009). We also calculate the asset-weighted average of managerial ownership is 6 percentage points. Consistent with existing literature that documents a skewed distribution of insider ownership, the managerial ownership rate is highly skewed. Within our sample of 15,846 observations, 8,788 (55.56%) display managerial ownership of no more than 20%. Among 7,058 (44.54%) observations that show ownership greater than 20%, 3,570 (22.52%) are greater than 40%; and 1,108 (9.07%) are greater than 60%. The maximum managerial ownership in our sample is 100%.

[17]More specifically, we include all controls from Himmelberg, Hubbard, and Palia (1999) and some other miscellaneous controls. Three sets of variables are generally regarded to be related to both Tobin's Q and managerial ownership: firm size, moral hazard and firm idiosyncratic risk. Firm size controls are log of sales, $\log(Sale)$ and the squared term $(\log(Sale))^2$. Controls for moral hazard include Capital/Sale, the ratio of property, plant, and equipment (PPE) to sales, as well as its square; R&D/Capital, the ratio of R&D expenditures to PPE, and Adv/Capital, the ratio of advertising expenditures to PPE. Since not all firm-years report R&D/Capital and Adv/Capital, we set missing values of these two variables to be 0 and use two indicator variables for data availability of R&D/Capital and Adv/Capital to maintain sample size. CapExp/Capital, capital expenditures divided by PPE, and Op.Inc./Sale, operating income normalized by sales are also used by Himmelberg, Hubbard, and Palia (1999) to proxy for the link between high growth and discretionary investment opportunities. Firm idiosyncratic risk, Sigma, is calculated as the standard error of the residuals from a CAPM model estimated using daily return for the period covered by the annual sample. We apply the same procedure as in R&D/Capital and Adv/Capital to deal with missing values of Sigma to maintain sample size.

4.2 Replication of Himmelberg, Hubbard, and Palia (1999)

We first replicate the regression model in Himmelberg, Hubbard, and Palia (1999) with pooled cross-section OLS and firm fixed effects in Table 3. In comparison to their paper, we have used a larger and more recent sample of firms in a shorter horizon while maintained the same empirical specification and variable construction as theirs. Not surprisingly, our results paint a similar picture as in their report. The pooled cross sectional OLS shows a significant while negative association between ownership and performance. With fixed effects to control for firm-specific contracting environment, there no longer appears to be a significant association between managerial ownership and performance.

4.3 Nonparametric Evidence

Before estimating our parametric specification developed in Section 3.2, we would like to present some nonparametric evidence on the relationship between change in Tobin's Q and pre-determined level of managerial ownership in 2002. A kernel regression could help avoid imposing any functional form on the relationship between two variables under study. In particular, we use the Epanechnikov kernel with optimal bandwidth based on the formula of Silverman (1986). Figure 1 plots change in Tobin's Q from 2002 to 2004 on the top graph and conditional change[18] in Tobin's Q from 2002 to 2004 in the bottom graph, both against managerial share in 2002. The results from both graph suggest a non-linear pattern of the relationship between change in Tobin's Q and insider ownership: with a positive and almost linear relationship from zero to around 50%, then the effect decreases until zero as the managerial ownership becomes higher. Note that since there are only around 14% of firms with managerial ownership above 50%, the kernel regression for that region displays a larger confidence band. Overall, the nonparametric analysis provides strong evidence for heterogeneous effects across firms which is consistent with the theoretical predictions.

[18]We regress Tobin's Q on a set of standard controls and take the difference of residuals between 2004 and 2002 to be conditional change in Tobin's Q.

4.4 Main Results

We here present the main results of our difference-in-difference empirical model. We first regress Tobin's Q on the linear and quadratic terms of managerial ownership ratio at year 2002 interacted with treatment dummy *post2003*, then we add in more controls sequentially. The results in Table 4 indicate a significant effect of the increase in effective managerial ownership brought about by the tax cut on firm performance. In column 1, we include no controls and see a significant and hump-shaped treatment effect across firms. We add more controls sequentially from column 2 to column 4 following the literature. The results continue to display a significant hump-shaped effect, in column 4 with all controls, we see a linear treatment effect of 1.92 (s.e.[19]=0.30) and a quadratic treatment effect of -1.95 (s.e.=0.40), both significant at the 1% level. Our estimates indicate an inflection point for the treatment effect at around 49.4%. Our sample has an asset-weighted mean of managerial ownership at 6.01%. Informed by these coefficients, this translates into an increase of 0.11 in Tobin's Q, or 5.41% improvement, given an average of Tobin's Q of 2.03 in our sample[20].

4.5 Results by Year and Pre-trend Tests

We estimate a model similar to our main regression above except that we have replaced the treatment dummy $post2003$ with dummy for each year in our sample except our base year 2002. The results are reported in Table 5. Our results demonstrate that there is no differential trend in firm performance before the 2003 Tax Cut took place as these estimated coefficients are not significantly different from 0. We extend our sample to be from 1998 to 2006 and run similar regression as in Table 5 and plot in Figure 2 the estimated coefficients as well as 95% confidence intervals for the year dummies interacted treatment intensity. Again we see no pre-trend for years before 2003.

[19] s.e. stands for standard errors in all appearances.

[20] We prefer to interpret our results using the asset-weighted mean managerial ownership instead of the unweighted mean as firm size is negatively correlated with managerial ownership and using asset-weighted mean managerial ownership will provide a better illustration of the average effects of the 2003 Tax cut. Alternatively, we calculate every firm's improvement in Tobin's Q implied by our regression estimates and find the asset-weighted mean of the improvement in Tobin's Q to be 3.45%.

These results greatly support our identifying assumption and thus the validity of our difference-in-difference empirical strategy. It is also worth noting that the treatment effect of 2003 Tax Cut, when examined in each separate year, is quite persistent. The treatment effects in 2003 for linear and quadratic ownership rate are respectively 1.53 (s.e.=0.31) and -1.91 (s.e.=0.43) , both significant at 1% level. These treatment effects increase in magnitude at year 2004, with estimated effects for linear and quadratic ownership rate becoming 2.09 (s.e.=0.34) and -2.56 (s.e.=0.47), both significant at 1% level. Year 2005 displays similar results as in previous years. The treatment effects gradually decrease as the time moves away from the treatment year.

4.6 Placebo Tests

A key identifying assumption for our difference-in-difference empirical design is that there would be no *differential* change in performance for firms with different levels of managerial ownership in the absence of tax cut. Here we would like to provide more support for this assumption by repeating our previous empirical exercises in periods when there is no change in tax rate. In particular, we examine the results from two placebo difference-in-difference empirical designs in 1999 and 2000 respectively, using sample periods 3 years before and after the placebo tax cut date. To determine treatment intensity, we have used firm's managerial ownership one year immediately before our placebo tax cut date. That is, in the placebo test of 1999, we use the managerial ownership in year 1998 as our treatment intensity. The empirical model follows the main specification before.

We present the results of this exercise in Table 6. The estimates for the treatment effect are not significantly different from 0 in both cases. The point estimates are also much smaller in magnitude compared with our 2003 Tax Cut results. In the 1999 placebo test, the linear and quadratic treatment coefficients are -0.17 (s.e.=0.29) and 0.19 (s.e.=0.37) (Column 2) while we obtain 0.11 (s.e.=0.33) and 0.22 (s.e.=0.44) (Column 4) in the 2000 placebo test. Overall, the findings of our placebo tests add credence to our identifying assumption that firm performance could have evolved similarly with regard to managerial ownership without the 2003 Tax Cut.

We also want to point out that these results can also rule out some endogeneity concerns about change in managerial ownership and firm's future performance. If managers possess private information about firm's future performance unobservable to econometricians and change their ownership accordingly, then we could detect a spurious relationship rather than a causal effect of higher managerial incentive to firm performance. However, such spurious relation can not be found in previous literature which documents there is no correlation between performance and ownership after controlling for firm fixed effect. In addition, the lack of within-firm variation in ownership ratio may imply that this concern is not critical, or otherwise we would expect to see ownership changed more frequently and dramatically. In our context, this story would predict that firms with generally higher managerial ownership should see a higher performance improvement in the next period, whether we examine those firms in treatment years of 1999, 2000 or 2003. This clearly cannot reconcile results from our placebo tests.

4.7 Robustness Checks Concerning Confounding Macro Shocks

As discussed before, the validity of our empirical strategy clearly hinges on the identification assumption that firms with differential levels of managerial ownership would have evolved similarly without the 2003 Tax Cut. One potential concern regarding this assumption is due to the fact that managerial ownership is in general correlated with other firms characteristics such as firm age, size, investment intensity, there could have been other macro economic shocks which took place around 2003 and affected firms' investment opportunities for firms with different characteristics differentially. It is even possible that these confounding macro economic shocks are driven by the 2003 Tax Cut, for example, the 2003 Tax Cut reduced firms' cost of capital and thus could lead to improved performance for firms with better investment opportunities. These confounding macro shocks will invalidate our empirical design as increase in managerial ownership. We note that if such confounding differential time trends existed, their effects on firm performance should also correlate with the managerial ownership in our hump-shaped manner. This is not unlikely, for ex-

ample, young firms could have higher managerial ownership and better investment opportunities. Our first attempt to formally deal with this concern is to fully saturate our empirical model with 3-digit industry[21] by year dummies, so essentially we are comparing firms with differential managerial ownership facing the same time-varying industry macro shocks. In the first two columns of Table 7 we present results from our main regression including the industry-by-year dummies, with and without controls. They clearly show that our main results hold against this consideration: results again demonstrate a statistically significant hump-shaped increase in firm performance. While the point estimates decline slightly, the respective confidence interval contains the point estimates in our earlier main regression. A second attempt is to do our Diff-in-Diff empirical analysis using matched firms which otherwise looked similarly. More specifically, we use firms whose managerial ownership belong to the mid-tercile of the whole sample and then match with other firms based on log sales, capital over sales, income over sales, investment over capital, R&D over sales, firm age as well as industry. Our nearest-neighbor estimator is able to find 846 distinct matched firms for the 1186 firms. Results using main specification on this matched sub-sample is presented in column 3 to 4 of Table 7. Again, we uncover significant treatment effects due to the tax cut on the matched sample, similar to our full sample. Lastly, we follow Chetty and Saez (2004) and use Canadian firms in the Compustat to do another placebo test. This placebo test is valid since few executives of Canadian firms reside in US and pay US dividend taxes. Besides, Canadian firms are likely to share similar confounding macro shocks as the US firms. Although we don't know the actual managerial ownership of these Canadian firms, we can predict the Canadian firms' managerial ownership based on known firm characteristics. If the results in our main regression is due to confounding macro shocks that affect firms with different characteristics and the effects also significantly correlate with managerial ownership, then we should expect to find significant treatment effects even using the predicted managerial ownership, irrespective of whether the predicted managerial ownership is a good measure of the true managerial ownership or not. To be clear, we

[21] There are 234 3-digit SIC industries in our sample.

use all controls in our main regression as predictor for the actual managerial ownership for US firms, and take the regression coefficients as well as controls of Canadian firms to predict for their managerial ownership. In column 5 and 6 of Table 7, we simply can not identify any statistically or economically significant treatment effects for the Canadian firms. To add further credence to our empirical results, we show in column 7 to 8 of Table 7 that a subsample of US firms which match characteristics of these Canadian firms display significant treatment effects. The matching is again done using nearest-neighbor estimator and based on log sales, capital over sales, income over sales, investment over capital, R&D over sales, firm age as well as industry. Overall, we believe our empirical analysis in this subsection provide convincing evidence that our results are not due to confounding macro shocks coincided with the tax cut.

4.8 Heterogeneous Effects by Proxies of Agency Issues

Our results in previous subsections demonstrate the increased managerial incentive due to 2003 Tax cut affected firm performance for firms with differential managerial ownership. There is good reason to expect an additional layer of cross-sectional variation. More specifically, if the change in firm performance is indeed driven by a boost in managerial incentive, then the effects of our tax cut should move systematically with the severity of the agency problem. Relatedly, in the optimal contracting literature, it was argued that an important rationale for managers to hold shares in the firm is the bonding motive (for example, Fahlenbrach and Stulz (2009)): firms with more information asymmetry and/or higher monitoring costs between managers and shareholders could display higher managerial ownership.

Here we would like to divide our sample according to a set of proxies for these agency problems and test if the treatment effects do vary as theory would predict. Our first proxy is the ratio of R&D spending to capital as discretionary spending items are hard to observe and less easily monitored (Aboody and Lev (2000)). Motivated by Jensen (1986), uncommitted or free cashflow could provide managers incentive to over-invest. Thus higher free cashflow could proxy for more severe

agency problem. Our second proxy is the fraction of assets held in cash, also used in Chava and Roberts (2008). We also follow Moeller, Schlingemann, and Stulz (2007) and use idiosyncratic volatility as our third proxy for informational asymmetry.

The results of our analysis are presented in Table 8. The column 1 and 2 estimates separately the treatment effects of managerial ownership on firm performance for firms which have R&D spending to capital ratio below sample median and above sample median. While both subsamples are statistically significantly affected by the tax cut, we find the economic magnitude of the improvement in firm performance for high opaqueness firms proxied by the R&D spending ratio is over twice the size of low opaqueness firms. We pool these two samples together in column 3 to test the statistical significance of the difference, which produces a P-value of 0.014. We examine the heterogeneous effects on firms of different free cashflow proxied by cash holding ratio of asset in column 4 and 5. Similarly, we find firms with large cash holding improve their performance significantly more than firms with small cash holding. Again jointly testing the significance of the coefficients in two subsamples do not differ from each other produces a P-value well below 0.001. Results on firm asymmetric information proxied by stock idiosyncratic volatility reveals similar statistically significant patterns as the previous proxies for agency problem inside the firm.

5 Interactive effects of managerial ownership and other governance channels

In this section we investigate how the change in managerial ownership incentive brought about by tax cut interacts with other channels of corporate governance in the literature by examining the heterogeneous treatment effects across firms. The set of channels of corporate governance we consider include: anti-takeover index such as G-index (E-index), the strength of concentrated institutional ownership, and firm leverage. This empirical exercise is interesting for a number of reasons. For our main purposes, it helps to strengthen our argument that the 2003 Tax Cut causally affects firm

performance through the channel of providing higher incentive to managers. If the increase in performance is due to a better alignment of interests between managers and shareholders, then we would expect that this treatment effect to be particularly significant for firms with relatively poor corporate governance that leaves a lot of room for agency problems. At the same time, we provide a set of novel and comprehensive evidence on the substitution between managerial shareholding, a form of governance, and other co-existing channels of corporate governance.

5.1 Interactive Effects of Managerial Ownership and Antitakeover Provisions

We first focus on a subsample of firms with available corporate governance measure of G-index (Gompers, Ishii, and Metrick (2003)), which consists of 24 antitakeover and shareholder rights provisions. This reduces our sample observations substantially to 4,381 firm-year. We estimate our main regression separately for firms with G-index above the sample median and below the sample median so that we could achieve balanced sample size. The results are reported in Column 1-3 of Table 9. Column 1 for low G-index (good corporate governance) sub-sample and column 2 for high G-index (weak corporate governance) sub-sample. Clearly for those firms with relatively good corporate governance, there is no statistically significant treatment effects from the 2003 Tax Cut. In column 1 with a full set of controls, the magnitude of treatment effect for linear term is -0.12(s.e.=0.86), and for quadratic term is 0.60 (s.e.=1.41), neither is significant at conventional levels. In comparison, for firms with high G-index score, the coefficients for linear and quadratic terms are 1.86 (s.e.=0.80) and -2.10 (s.e.=1.62), with the linear term being significant at 5% level. We also examine if the treatment effect for the two sub-samples are indeed statistically different in a regression pooling samples together as in column 3 in Table 9. The P-value for the null hypothesis that these coefficients are the same is 0.00, strongly rejects the null. We also want to note that for these two sub-samples of firms with non-missing G-index, the R^2 almost doubles compared

with our main regression, indicating our empirical model has better fit for this sub-sample. Thus our results that firms with poor corporate governance have no significant improvement in firm performance should not be interpreted as lack of fit or power due to relatively small sample size.

We obtain similar results if we use another common measure of the level of corporate governance, E-index (Bebchuk, Cohen, and Ferrell (2009)), which consists of 6 of the 24 provisions listed in G-index. The results are presented in Column 4-6 of Table 9. Again we find only firms with weak corporate governance have significantly improved their performance, and the treatment effect displays a hump-shaped fashion, consistent with the main results. We also test if the effects are indeed statistically the same across the two sub-samples and obtain a P-value below 0.01.

Results from the above suggest that managerial ownership seems to substitute with internal corporate governance as proxied by the strength of anti-takeover protection and shareholder rights. Providing enough managerial ownership incentive could potentially help align the interests of managers with shareholders, particularly when managers could enjoy entrenchment as protected from anti-takeover provisions and other provisions that weaken shareholder rights. At the same time, these results from examining the interaction of corporate governance and managerial ownership greatly strengthens our argument for the specific channel of the improvement in firm performance. Poorly governed firms are those that are most likely to have agency problems and room for improvement. The literature find that firms with better corporate governance are associated with higher Tobin's Q (Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, and Wang (forthcoming)). If one is concerned that the increase in Tobin's Q come from channels other than increased managerial ownership incentive, for example, an increased interest in the market for corporate control for some firms, then those firms with low G-index or E-index should have been positively affected more. Results from our empirical analysis clearly refute this story.

5.2 Interactive Effects of Managerial Ownership and Institutional Ownership/Blockholder Governance

The corporate governance literature demonstrates blockholders and institutional investors with substantial ownership stake could affect firms in important ways such as monitoring[22]. We therefore examine how the increase in managerial ownership incentive interacts with external governance effects from concentrated institutional ownership. Compared with firm internal governance using measure of G-index or E-index, we are also able to fully utilize our sample size as most firms have information on their institutional holdings.

In particular, we do regression as in our main results on groups of firms with above-median and below-median top-5 institutional ownership separately[23]. Results are shown in column 7 to 9 in Table 9. For firms with below-median institutional ownership, ie, those firms with relatively weaker external governance from institutional shareholders, we find treatment effects for the linear term of 2.18 (s.e.=0.46) and for the quadratic term of -2.52 (s.e.=0.57), both significant at 1% level in column 7. While for firms with above-median concentrated institutional ownership, we detect a much milder effect both in terms of economic magnitude and statistical significance: with the linear term of 0.94 (s.e.=0.50) and for the quadratic term of -0.12 (s.e.=0.90), and only the linear term is significant at 10% level in column 8. In terms of economic magnitude, an average firm with weak institutional governance have double the effect from tax cut than an otherwise similar firm with strong institutional governance. We also pool these two groups of firms together in a joint regression to see if the treatment effect from firms with below-median institutional ownership is indeed statistically different from the other group of firms. Results in column 9 of Table 9 confirm this is indeed the case. The P-value for testing if the coefficients for the two sub-samples are the same is 0.00. Consistent with our agency interpretation, those firms with relatively weak

[22] See works such as Shleifer and Vishny (1986), Hartzell and Starks (2003), Cremers and Nair (2005), Edmans (2009), and Edmans and Manso (2011).

[23] The choice of top-5 institutional ownership follows Hartzell and Starks (2003).

external governance from below-median institutional ownership are those that have left managers a lot of leeway in firm's operation and have indeed improved their performance more as a result of increased managerial ownership incentive. Before showing this result, one could have been concerned that since the 2003 Tax Cut affected not only the incentive of share-holding managers but also tax-paying institutional investors with substantial stakes, those institutional investors could have pushed for an increase in firm performance as they themselves also have higher incentive. We want to point out a number of reasons why this story is not likely to a major concern for us. First of all, managerial ownership is mechanically a substitute for institutional ownership. In our sample, there is a -0.3 negative correlation between these two measures. If the first-order underlying channel is that institutional investors have pushed for a better performance in firms they own, the effect should be particularly strong in firms with low managerial ownership, thus goes *against* our main results[24]. Second, our results in this section is clearly contrary to this story, as we find a statistically significant stronger effect in firm performance for those firms with below-median institutional ownership, *ceteris paribas*. Our results also suggest insider governance from managerial ownership substitutes with external governance from institutional investors.

5.3 Interactive Effects of Managerial Ownership and Firm Leverage

Theoretical literature demonstrates that firm leverage could also be used as a means for corporate governance: a higher leverage ratio could help reduce the agency problem induced by free cash-flow and discourage managers to enjoy the quiet life (Jensen (1986); Zwiebel (1996)). A recent growing literature argues that creditors also play an important role in corporate governance well before a firm nears bankruptcy stage, notably through the use of debt covenants as a tripwire (for example, Chava and Roberts (2008) and Nini, Smith, and Sufi (2012)). We divide our sample into firms with above and below sample-median leverage ratio and examine how the treatment effects

[24]We also try including the top-5 institutional ownership in 2002 interacted with the treatment dummy of post2003 as an extra control and find our results are robust to this specification as well.

differ across these two groups. As reported in Column 10-12 of Table 9, we find both groups of firms have been significantly affected by the increase in managerial incentive. In particular, we see the effect for lower leverage firms is 2.10 (s.e.=0.56) for linear term and -2.09 (s.e.=0.74) for quadratic term while the effect for higher leverage firms is dampened with linear effect being 1.36 (s.e.=0.26) and quadratic effect being -1.40 (s.e.=0.34). While both groups of firms have been affected significantly in a hump-shaped manner, a lower leverage firms on average achieves a 50% higher improvement in firm performance than an otherwise similar higher leverage firm. The P-value that these coefficients are the same across two groups is well below 0.001. When estimating the difference between these two groups in a joint regression in column 12, we find that for firms with higher leverage, the effect is significantly smaller: the difference of the linear treatment effect between the two groups is -1.15 (s.e.=0.33) and the quadratic term is 1.29 (s.e.=0.52), both significant at 1% level. The result that managerial ownership also plays a complimentary role with firm leverage in corporate governance resonates with other evidence, for example, Atanassov (2013) finds leverage alleviates the negative effect of state-antitakeover laws on corporate innovation.

6 Robustness Check

In this section we conduct a battery of robustness tests beyond our tests for pre-determined trend and placebo tests for our main results. First, we confirm our results are robust when we measure our dependent variable in log instead of the raw value. Second, we add extra controls for dividend issuance in our empirical model to make sure our results are not affected by this concern. Third, we isolate a sub-sample of firms whose largest institutional investor is not affected by the 2003 Tax Cut and find similar patterns as the whole sample. Fourth, we confirm the robustness of our results allowing for more flexible structure in the serial correlation of error terms using bootstrap or two-way clustering by firm and year. We also examine alternative measures of firm operating performance and again find similar effects as our main regression.

6.1 Logged Tobin's Q

One might be concerned that to the extent the dividend tax cut has mechanical scaling valuation effect on firm valuation, using the raw measure of Tobin's Q might capture that scaling valuation effects. We first want to point out that the mechanical scaling effect can not explain our sub-sample results in agency issues and interaction with other governance channels. We also employ a more direct approach to guard against this concern by repeating our main regression on logged Tobin's Q. As shown in column 1 to 2 in Table 10, our results are robust to this modification in dependent variable.

6.2 Dividend Issuance

As shown in Chetty and Saez (2005), the 2003 Tax Cut induced a sudden increase in dividend payout, particularly in firms of large managerial ownership. Recently Hartzmark and Solomon (forthcoming) find a general dividend month premium, i.e., there is abnormal return for the month of expected dividend issuance as some investors chase dividends and drive up stock return. In our case, one might conjecture that investors could foresee the large payout in firms with higher managerial ownership, prefer to buy and drive up the price of these stocks. Since the change in Tobin's Q is a measure closely related to stock return, we could have identified a spurious effect unrelated to the agency issues of interest. We can deal with this concern by directly controlling for dividend issuance, as dividend issuance is not our object of interest. In column 3 and 4 of Table 10, we include two variables to control for the effect of dividend issuance: the amount of dividend payout (measured as dividend yield) as well as an indicator of whether the firm issues dividend. Even though these two control variables are correlated with Tobin's Q with coefficients of -0.22 and 0.37 respectively and both are significant at 1% level, our results are robust to this consideration. The results are still robust when we include higher order series of these two controls, as well as them fully interacted with treatment dummies.

6.3 Firms with Non-affected Institutional Investors

In section 5.2 we examined the interaction of institutional investor ownership and managerial ownership and find only firms with below-median institutional ownership have significant improvement in firm performance. To strengthen the argument that our results are not driven by increased incentive in institutional investors, here we exploit the fact that some institutional investors have tax-favored accounts and were thus not affected by the reform. For example, pension funds were not subject to tax for their dividend income. If our results are largely driven by an increased incentive for institutional investors that push for better firm performance, then we would not expect to see any response from firms that such nonaffected entities could play an important role. This is essentially adopted from the strategy used in Chetty and Saez (2005). We isolated a sub-sample of firms whose largest institutional owner is not affected by the tax cut—they are pension funds, insurance companies, nonprofit organizations, nonfinancial corporations and government agencies—in the Thomson financial institutional ownership database. More specifically, nonaffected entities are those classified as insurance companies (type 2) and "others" (type 5) whose names indicate whether they are a pension fund, nonprofit organization, government agency, or nonfinancial corporation [25]. Isolating these non-affected firms gives us a much smaller sample of 4,030 firm-year. We essentially repeat our main regression for this sub-sample in column 5 and 6 of Table 10. However, we again obtain a non-linear treatment effect, with coefficients on linear and quadratic terms being 1.72 (s.e.=0.72) and -2.19 (s.e.=0.91), both significant at 5% level. This finding strongly demonstrates that our results are not driven by influence from institutional investors.

[25] After 1998, the Thomson financial database misclassified new institutions which actually should belong to type 1-4 categories as type 5 (other). Chetty and Saez (2005) hand-classify type 5 institutions throughout to address this data problem. We use their reclassification to correct for the errors in 13F.

6.4 Potential Serial Correlation

In our main regressions, we cluster standard errors at firm level, to allow for potential serial correlation within-firm. We follow Bertrand, Duflo, and Mullainathan (2004) to generate bootstrapped standard errors for 2000 iterations. As shown in column 7 of Table 10, our results are robust to considerations about serial correlation. We also allow for serial correlation at both firm and year level, as suggested by Petersen (2009), and the implementation follows Thompson (2011). Result in column 8 of Table 10 again confirms this does not affect our results.

6.5 Alternative Performance Measures

To the extent that we aim to shed light on the controversy over the relationship between managerial ownership and firm performance, we have used Tobin's Q as proxy for firm performance following literature, as this variable is in the center of debate. In this part, we also examine alternative measures of firm's operating performance as supporting evidence for the increase in firm performance. We examined four standard accounting measures of firm operating performance: operating return on asset (OROA), return on asset (ROA), net profit margin (NPM) and return on equity (ROE) [26]. While Tobin's Q as a measure of firm performance is able to capture investor's expectation about the future prospect of the firm, these measures for operating performance capture the concurrent performance of the firm. We use these measures separately as dependent variable in a regression similar as our difference-in-difference specification[27]. Results are presented in Table 11. In column 1 and 2, the dependent variable is OROA. Consistent with results in main regression, we find a hump-shaped effect due to tax cut, with coefficient on linear term being 0.11 (s.e.=0.03) and quadratic term being -0.13 (s.e.=0.05) , both statistically significant at 1% level. Results on other

[26]These variables are defined according to Pérez-González (2006) and Giroud and Mueller (2010) respectively as: operating income over book value of assets, net income over book value of assets, net income over sales and net income over book value of common stock.

[27]Following Gormley and Matsa (2013), we do not include controls such as the mean(median) of the dependent variable in an SIC industry.

measures of operating performance display similar patterns from column 3 to 8. However, we present results with caveat from the literature that these measures of operating performance could be manipulated by managers and treat them as suggestive evidence that support our main results.

7 Conclusion

In this paper, we use the 2003 Tax Cut to help shed light on the long-standing controversy over whether managerial ownership affects firm performance. The 2003 Tax Cut creates an abrupt change in the managerial net-of-tax effective ownership and is therefore an ideal setting for us to conduct a difference-in-difference empirical analysis. Our results show that increase in the effective managerial ownership significantly leads to an increase in firm performance in a non-linear fashion: firms with intermediate level of managerial ownership has high improvement in firm performance while the effect is small for firms with very low or very high managerial ownership. Our results are robust to examination of pre-determined trend or placebo tests as well as other checks. We also rule out the concern that our results are driven by confounding macro shocks coincided with the 2003 Tax Cut. Furthermore, we investigate how managerial ownership interacts with other channels of governance mechanisms like anti-takeover protection proxied by G-Index or E-Index and concentrated institutional holding. We find that only firms with weak internal corporate governance are significantly affected and in a hump-shaped manner by the tax cut. At the same time, firms with weak institutional governance increase their performance significantly more. These findings further support our claim that the increase in firm performance is driven by the increase in managerial incentive, not through other alternative interpretations. Overall, our findings provide convincing empirical evidence for Jensen and Meckling (1976) that managerial ownership incentive has non-negligible effect on firm performance.

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Table 1: Variable Definition

Performance and Ownership Variables	
Tobin's Q	The market value of common equity plus book value of total liability plus book value of preferred stock divided by the book value of total asset
Share02	The sum of the fractions of shares held by all officers and directors in 2002, from Compact Disclosure
Share	The sum of the fractions of shares held by all officers and directors, from Compact Disclosure
Size controls	
log (Sale)	The natural log of sales
Moral hazard controls	
Capital/Sale	The ratio of property, plant and equipment to sales
Non missing Cap/Sale	A dummy variable equals to one if the data required to calculate Capital/Sale is available
Op. Inc. /Sale	The ratio of operating income before depreciation to sales
Non missing Op. Inc. /Sale	A dummy variable equals to one if the data required to calculate Op. Inc./Sale is available
R&D/Capital	The ratio of research and development expenditures to property, plant and equipment.
Non missing R&D	A dummy variable equals to one if the data required to calculate R&D/Capital is available
Adv/Capital	The ratio of advertising expenditures to property, plant and equipment
Non missing Adv	A dummy variable equals to one if the data required to calculate Adv/Capital is available
CapExp/Capital	The ratio of capital expenditure to property, plant and equipment
Non missing CapExp/Cap	A dummy variable equals to one if the data required to calculate CapExp/Capital is available
Risk controls	
Sigma	The idiosyncratic stock return risk, calculated as the standard error of the residuals from a CAPM model estimated using daily stock return data for the period covered by the annual sample
Non Missing Sigma	A dummy variable equals to one if the data required to calculate Sigma is available
Miscellaneous controls	
Leverage	Long-term debt divided by the book value of total assets
Non missing Leverage	A dummy variable equals to one if the data required to calculate Leverage is available
Cash / Asset	The ratio of cash and short-term investment to asset
Age	The listing age of a firm as measured by the number of years since its IPO as reported in CRSP
Non-missing Age	A dummy variable equals to one if data required to calculate Long term Age are available
Corporate Governance Variables	
G-Index02	G-Index in 2002 from Gompers, Ishii, and Metrick (2003)
E-Index02	E-Index in 2002 from Bebchuk, Cohen, and Ferrell (2009)
Inst. Holding02	Institutional ownership concentration proxied by total share of top five institution holdings in 2002
Other variables	
Dividend	Dividend yield calculated as dividend payout over stock price
Positive Dividend	A dummy variable equals to one if dividend payout is positive
Non-tax Insti. Holders	Institutional investors that do not pay taxes, hand collected by Chetty and Saez (2005).
NPM	Net profit margin defined as the ratio of net income over sales
ROE	Return on equity defined as the ratio of net income over book value of common stock
OROA	Operating return on asset defined as the ratio of operating income over book value of asset
ROA	Return on asset defined as the ratio of net income over book value of asset

Table 2: Summary Statistics for All Variables Used in the Paper

S.D. is sample standard deviation of the corresponding variable while p10(/50/90) is the 10(/50/90) percentile of the variable of interest. The number of observations for each variable varies based on data availability. Definitions of all variables are in Table 1.

	Obs.	Mean	S.D.	p10	p50	p90
Valuation and ownership variables						
Tobin's Q	15846	2.027	1.514	0.845	1.507	3.957
Share02	15846	0.238	0.221	0.022	0.161	0.576
Share	13346	0.238	0.219	0.024	0.163	0.574
Size controls						
log (Sale)	15846	4.928	2.462	1.862	4.981	8.012
Moral hazard controls						
Capital/Sale	15829	1.366	44.996	0.034	0.183	1.140
Non missing Cap/Sale	15846	0.999	0.033	1.000	1.000	1.000
Op. Inc. /Sale	15802	-2.680	68.596	-0.613	0.083	0.269
Non missing Op.Inc./Sale	15846	0.997	0.053	1.000	1.000	1.000
R&D/Capital	10213	2.617	39.442	0.000	0.315	4.109
Non missing RD	15846	0.645	0.479	0.000	1.000	1.000
Adv/Capital	5609	0.489	2.935	0.010	0.098	0.838
Non missing Adv	15846	0.354	0.478	0.000	0.000	1.000
CapExp/Capital	15600	0.330	4.702	0.060	0.212	0.596
Non missing CapExp/Cap	15846	0.984	0.124	1.000	1.000	1.000
Risk controls						
Sigma	13825	0.041	0.027	0.016	0.034	0.076
Non Missing Sigma	15846	0.872	0.334	0.000	1.000	1.000
Miscellaneous controls						
Leverage	15841	0.172	0.251	0.000	0.085	0.444
Non missing Leverage	15846	1.000	0.018	1.000	1.000	1.000
Cash / Asset	15846	0.209	0.234	0.009	0.108	0.586
Age	9293	7.480	5.282	2.000	7.000	14.000
Non-missing Age	15846	0.586	0.492	0.000	1.000	1.000
Corporate governance						
G-Index02	5091	9.166	2.612	6.000	9.000	13.000
E-Index02	4904	2.472	1.263	1.000	2.000	4.000
Inst. Holding02	15846	0.187	0.146	0.000	0.190	0.373
Other variables						
Dividend	4145	0.055	0.312	0.000	0.014	0.045
Positive Dividend	15846	0.262	0.440	0.000	0.000	1.000
Non-tax Largest Inst Holding	12536	0.057	0.233	0.000	0.000	0.000
OROA	15802	0.041	0.191	-0.259	0.097	0.224
ROA	15846	-0.069	0.237	-0.431	0.021	0.121
NPM	15846	-0.240	0.710	-0.958	0.017	0.137
ROE	15845	-0.064	0.485	-0.706	0.063	0.313

Table 3: Replication of Himmelberg, Hubbard, and Palia (1999)

The table replicates the specifications of OLS and FE in Himmelberg, Hubbard, and Palia (1999). Definitions of all variables are provided in Table 1. Share ownership, Share, is the sum of the fractions of shares held by all directors and officers. The data are from Compact Disclosure and range from 2000 to 2005. Regressions in all columns include year-fixed effects and in column 3 and 4 include firm-fixed effects. See Table 4 for a complete list of controls. Robust standard errors are reported in parentheses. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q			
	OLS		FE	
	(1)	(2)	(3)	(4)
Share	-0.657**	-1.333***	0.112	-0.009
	(0.273)	(0.272)	(0.366)	(0.363)
Share squared	0.235	1.048***	0.189	0.263
	(0.349)	(0.337)	(0.429)	(0.425)
Year fixed effects	Yes	Yes	Yes	Yes
Firm Fixed Effect	No	No	Yes	Yes
Firm Size Control	No	Yes	No	Yes
Moral Hazard Control	No	Yes	No	Yes
Firm Risk Control	No	Yes	No	Yes
Miscellaneous Control	No	Yes	No	Yes
Observations	13346	13346	13346	13346
R^2	0.021	0.176	0.037	0.058

Table 4: Main Results

This table reports results from our difference-in-difference (DID) estimations for the effect of managerial ownership on firm performance. The dependent variable is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q			
	(1)	(2)	(3)	(4)
Share02*post2003	1.943***	1.938***	1.921***	1.923***
	(0.295)	(0.296)	(0.296)	(0.295)
ShareSq02*post2003	-1.973***	-1.982***	-1.963***	-1.945***
	(0.401)	(0.402)	(0.401)	(0.397)
Firm Size Control				
log (Sale)		-0.127***	-0.118**	-0.063
		(0.047)	(0.054)	(0.055)
(log (Sale)) squared		0.000	-0.003	0.000
		(0.005)	(0.006)	(0.006)
Moral Hazard Control				
Capital/Sale			0.000	0.000
			(0.001)	(0.001)
(Capital/Sale) squared			0.000	0.000
			0.000	0.000
Non missing Cap/Sale			0.139	0.174
			(0.260)	(0.256)
Op. Inc. /Sale			0.000	0.000
			0.000	0.000
Non missing Op.Inc./Sale			-0.005	-0.05
			(0.273)	(0.289)
R&D/Capital			-0.001**	-0.001**
			0.000	0.000
Non missing R&D			-0.064	-0.075
			(0.092)	(0.091)
Adv/Capital			0.00	0.00
			(0.008)	(0.008)
Non missing Adv			0.001	-0.005
			(0.061)	(0.061)
CapExp/Capital			(0.00)	-0.001*
			(0.001)	(0.001)
Non missing CapExp/Cap			0.081	0.058
			(0.134)	(0.135)
Firm Risk Controls				

Sigma				-1.959***
				(0.594)
Non Missing Sigma				-0.271***
				(0.074)
Miscellaneous controls				
Leverage				0.201*
				(0.118)
Non missing Leverage				0.168
				(0.438)
Cash / Asset				0.959***
				(0.162)
Age				-0.018
				(0.014)
Non Missing Age				-1.473***
				(0.041)
Firm Fixed Effect	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	15846	15846	15846	15846
R^2	0.04	0.04	0.04	0.06

Table 5: Pre-trend

This table examines pre-trend and heterogeneous treatment effects across years. The dependent variable is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. For each year in our sample, we create year-specific treatment effects (for example, Share02*2000 and ShareSq02*2000) by interacting the year dummy with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. We omit year of 2002 as our base year. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q			
	(1)	(2)	(3)	(4)
Share02*2000	-0.220	-0.210	-0.226	-0.300
	(0.381)	(0.380)	(0.379)	(0.377)
ShareSq02*2000	-0.502	-0.510	-0.492	-0.441
	(0.488)	(0.486)	(0.485)	(0.481)
Share02*2001	-0.113	-0.112	-0.137	-0.159
	(0.280)	(0.279)	(0.279)	(0.278)
ShareSq02*2001	-0.352	-0.352	-0.326	-0.324
	(0.364)	(0.363)	(0.363)	(0.361)
Share02*2003	1.562***	1.548***	1.526***	1.525***
	(0.311)	(0.311)	(0.311)	(0.309)
ShareSq02*2003	-1.940***	-1.932***	-1.908***	-1.912***
	(0.432)	(0.433)	(0.432)	(0.428)
Share02*2004	2.140***	2.144***	2.115***	2.089***
	(0.338)	(0.339)	(0.339)	(0.337)
ShareSq02*2004	-2.596***	-2.617***	-2.584***	-2.560***
	(0.470)	(0.471)	(0.471)	(0.467)
Share02*2005	1.869***	1.889***	1.847***	1.786***
	(0.374)	(0.376)	(0.376)	(0.371)
ShareSq02*2005	-2.298***	-2.336***	-2.290***	-2.196***
	(0.506)	(0.508)	(0.508)	(0.502)
Firm Fixed Effect	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Miscellaneous Control	No	Yes	Yes	Yes
Firm Size Control	No	No	Yes	Yes
Moral Hazard Control	No	No	No	Yes
Firm Risk Control	No	No	No	Yes
Observations	15846	15846	15846	15846
R^2	0.04	0.044	0.046	0.061

Table 6: Placebo Test

This table reports two falsification tests where 1999 and 2000 are used as two separate year of placebo 'Tax Cut'. We replicate our difference-in-difference empirical strategy to year 1999 shown in column 1 and 2 and to year 2000 shown in column 3 and 4. The dependent variable is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. For each placebo test, we create treatment effects, ShareYR(-1)*postYR and ShareSqYR(-1)*postYR by interacting the post-treatment year dummy, postYR with linear and quadratic terms of treatment intensity. Treatment intensity, ShareYR(-1), is the sum of the fractions of shares held by all directors and officers one year before the placebo treatment year (1999 and 2000, respectively) from Compact Disclosure while ShareSqYR(-1), is the squared of ShareYR(-1). We omit the year before placebo treatment year as our base year. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. Our regressions use sample 3 years before and after the respective placebo treatment year. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q			
	YR=1999		YR=2000	
	(1)	(2)	(3)	(4)
ShareYR(-1)*postYR	-0.449	-0.170	-0.203	0.110
	(0.288)	(0.285)	(0.360)	(0.333)
ShareSqYR(-1)*postYR	0.589	0.193	0.595	0.222
	(0.370)	(0.369)	(0.480)	(0.443)
Firm Size Control	No	Yes	No	Yes
Moral Hazard Control	No	Yes	No	Yes
Firm Risk Control	No	Yes	No	Yes
Miscellaneous Control	No	Yes	No	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	18822	18822	18739	18739
R^2	0.053	0.128	0.046	0.119

Table 7: Robustness Checks on Confounding Macro Shocks

This table conducts robustness checks to deal with concerns on confounding macro shocks all using our difference-in-difference (DID) main specification. Column (1)-(2) include 3-digit SIC industry by year dummies. Column (3)-(4) apply our empirical strategy on firms whose managerial ownership belong to second tercile of the distribution and matched firms based on log sales, capital over sales, income over sales, investment over capital, R&D over sales, firm age as well as industry. Column (5)-(6) restrict to Canadian firms in Compustat where the managerial ownership ratio is predicted using all controls in linear regression. Column (7)-(8) restrict to US firms that match Canadian firms based on log sales, capital over sales, income over sales, investment over capital, R&D over sales, firm age as well as industry. The dependent variable in all columns is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q							
	Year*SIC3 fixed effects		Matched Subsample		Canadian firms as placebo group			
					Canadian firms		Matched U.S. firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share02 * post2003	1.752***	1.670***	1.663***	1.589***	-0.346	0.554	2.337***	2.257***
	(0.323)	(0.322)	(0.479)	(0.480)	(0.844)	(0.818)	(0.632)	(0.634)
ShareSq02*post2003	-1.710***	-1.619***	-1.563***	-1.499**	-0.937	-2.234	-2.656***	-2.576***
	(0.431)	(0.427)	(0.587)	(0.588)	(1.801)	(1.719)	(0.880)	(0.875)
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*SIC3 fixed effects	Yes	Yes	No	No	No	No	No	No
Control	No	Yes	No	Yes	No	Yes	No	Yes
Observations	15846	15846	8708	8708	4572	4572	3482	3482
R^2	0.124	0.141	0.040	0.061	0.026	0.057	0.056	0.074

Table 8: Heterogeneous Effects on Agency Proxy

This table examines the heterogeneous effects of managerial ownership on firm performance for firms with different levels of agency issues. We use three proxies of the agency problem between managers and shareholders: column (1)-(3) uses R&D spending ratio following Aboody and Lev (2000), column (4)-(6) uses cash holding ratio following (Chava and Roberts (2008) and column (7)-(9) uses idiosyncratic stock volatility, or Sigma following Moeller, Schlingemann, and Stulz (2007). The dependent variable is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. In column (1), (4) and (7), we restrict our sample to firms with below-sample-median agency proxies. In column (2), (5) and (8) we restrict our sample to firms with above-sample-median agency proxies. In column (3), (6) and (9), we pool all sample and allow treatment to vary with subsamples with below/above median agency proxies. The number of variables varies with the availability of different agency proxies. We report the F statistics and p-value for a joint test of whether the linear and quadratic terms are different for the below- and above-median subsamples (Share02*post*Above Med and ShareSq02*post*Above Med). Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q								
	R&D / Capital			Cash / Asset			Idiosyncratic Volatility		
	LOW	HIGH	ALL	LOW	HIGH	ALL	LOW	HIGH	ALL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share02 * post2003	1.283***	3.064***	1.621***	1.273***	2.696***	1.555***	0.801***	1.417**	1.231***
	(0.421)	(0.734)	(0.437)	(0.270)	(0.560)	(0.278)	(0.302)	(0.638)	(0.319)
ShareSq02*post2003	-1.067**	-2.850***	-1.362**	-1.448***	-2.579***	-1.746***	-0.619	-1.491**	-0.916**
	(0.543)	(0.974)	(0.579)	(0.382)	(0.736)	(0.385)	(0.416)	(0.755)	(0.443)
Share02*post*Above Med			1.211**			0.626*			1.453***
			-0.525			(0.343)			(0.339)
ShareSq02*post*Above Med			-1.232			-0.213			-1.803***
			-0.85			(0.543)			(0.522)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5107	5106	10213	7923	7923	15846	6628	6628	13256
F-statistics			4.274			9.129			10.898
Prob > F			0.014			0.000			0.000
R^2	0.078	0.093	0.071	0.064	0.077	0.061	0.076	0.085	0.064

Table 9: Interaction with Alternative Governance Channels

This table examines how the effect of managerial ownership on firm performance interacts with alternative channels of corporate governance. Column (1)-(3) uses G-index following Gompers, Ishii, and Metrick (2003); Column (4)-(6) uses E-Index following Bebchuk, Cohen, and Ferrell (2009); Column (7)-(9) uses strength of concentrated institutional ownership, measured as the sum of the fractions of shares held by top-five institutions following Hartzell and Starks (2003); Column (10)-(12) uses leverage ratio. The dependent variable is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses. In column (1), (4), (7) and (10), we restrict our sample to firms with below-sample-median corporate governance measures. In column (2), (5), (8) and (11), we restrict our sample to firms with above-sample-median corporate governance measures. In column (3), (6), (9) and (12), we pool all sample with non-missing corporate governance measures and allow treatment to vary with subsamples with below/above median corporate governance measures. The number of variables varies with the availability of different corporate governance measure. We report the F statistics and p-value for a joint test of whether the linear and quadratic terms are different for the below- and above-median subsamples (Share02*post*Above Med and ShareSq02*post*Above Med). Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Tobin's Q											
	G-Index			E-Index			Institutional Holding			Leverage		
	LOW	HIGH	ALL	LOW	HIGH	ALL	LOW	HIGH	ALL	LOW	HIGH	ALL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Share02 * post2003	-0.119	1.859**	0.051	0.702	2.343***	0.290	2.181***	0.936*	2.209***	2.097***	1.357***	2.381***
	(0.855)	(0.803)	(0.700)	(0.827)	(0.839)	(0.672)	(0.463)	(0.504)	(0.340)	(0.555)	(0.260)	(0.368)
ShareSq02*post2003	0.600	-2.102	0.386	-0.499	-3.391**	-0.053	-2.523***	-0.121	-2.406***	-2.086***	-1.399***	-2.454***
	(1.413)	(1.622)	(1.276)	(1.463)	(1.581)	(1.299)	(0.572)	(0.899)	(0.470)	(0.742)	(0.340)	(0.547)
Share02*post*Above Med			2.065**			2.835***			-1.263***			-1.145***
			(0.832)			(0.789)			(0.351)			(0.326)
ShareSq02*post*Above Med			-2.891			-4.599***			2.241***			1.292**
			(1.779)			(1.706)			(0.606)			(0.518)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2167	2214	4381	2455	2449	4904	7205	7205	14410	7921	7920	15841
F-statistics			5.002			7.687			6.894			8.694
Prob > F			0.007			0.000			0.001			0.000
R^2	0.125	0.116	0.099	0.143	0.106	0.110	0.079	0.077	0.065	0.068	0.079	0.061

Table 10: Other Robustness Checks

This table reports results from our difference-in-difference (DID) estimations for the effect of managerial ownership on firm performance with different robustness checks. Column (1)-(2) use log of Tobin's Q instead of Tobin's Q itself. Column (3)-(4) include dividend payout variables as additional control. Column (5)-(6) restrict to firms whose largest institutional holder is not affected by the 2003 Tax Cut. Column (7)-(8) use different methods to calculate standard errors, with column (7) using bootstrap for 2000 times and column (8) allowing two-way clustering with both time and firm. The dependent variable in column (3) to (8) is Tobin's Q, defined as the ratio of the market value of assets to the book value of assets, where the market value of assets is calculated as the market value of common equity plus book value of total liability plus book value of preferred stock. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. Definitions of all other control variables are provided in Table 1. Robust standard errors clustered at firm-level are reported in parentheses (Column (1)-(6)). Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	Dependent Variable: Log Tobin's Q		Dependent Variable: Tobin's Q					
			Controlling Dividend		Non-Tax Inst. Holders		Bootstrap	Two-way Cluster
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share02 * post2003	0.877***	0.868***	1.876***	1.834***	1.677**	1.716**	1.923***	1.923***
	(0.114)	(0.114)	(0.294)	(0.293)	(0.721)	(0.718)	(0.239)	(0.367)
ShareSq02*post2003	-0.884***	-0.869***	-1.937***	-1.888***	-2.122**	-2.189**	-1.945***	-1.945***
	(0.157)	(0.155)	(0.400)	(0.396)	(0.926)	(0.907)	(0.322)	(0.413)
Dividend			-0.210***	-0.229***				
			(0.054)	(0.061)				
Positive Dividend			0.364***	0.384***				
			(0.044)	(0.044)				
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	No	Yes	No	Yes	No	Yes	No	No
Observations	15846	15846	15846	15846	4030	4030	15846	15846
R^2	0.075	0.099	0.046	0.068	0.028	0.067	0.007	0.698

Table 11: Alternative Measure of Performance

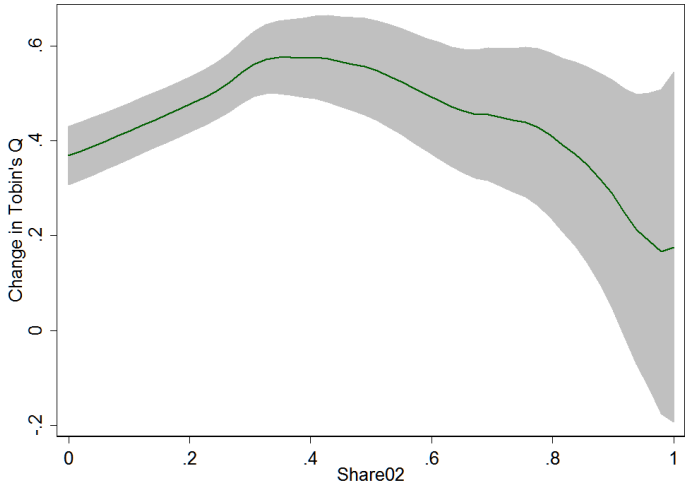
This table reports results from our difference-in-difference (DID) estimations for the effect of managerial ownership on firm performance, proxied by alternative accounting measures of firm operating performance. The dependent variable in column (1) and (2) is Operating Return on Assets (OROA) , defined as the ratio of operating income over book value of asset. The dependent variable in column (3) and (4) is Return on Assets (ROA), defined as the ratio of net income over book value of asset. The dependent variable in column (5) and (6) is Net Profit Margin (NPM), defined as the ratio of net income over sales. The dependent variable in column (7) and (8) is Return on Equity (ROE), defined as the ratio of net income over book value of common stocks. The key independent variables Share02*post2003 and ShareSq02*post2003 identify our treatment effects, which are the treatment dummy, post2003, interacted with linear and quadratic terms of treatment intensity. Treatment intensity, Share02, is the sum of the fractions of shares held by all directors and officers in 2002 from Compact Disclosure while ShareSq02, is the squared of Share02. We control for log(Sale), log(Sale)^2, age, dummy for non-missing age in the regressions for OROA, ROA and ROE, and log(Asset), log(Asset)^2, age, dummy for non-missing age in the regressions for NPM. Robust standard errors clustered at firm-level are reported in parentheses. Our sample ranges from 2000 to 2005. Regressions in all columns include year-fixed effects and firm-fixed effects. Coefficients marked with *, **, and *** are significant at 10%, 5%, and 1%, respectively.

	OROA		ROA		NPM		ROE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share02*post2003	0.112***	0.110***	0.134***	0.125***	0.335**	0.261*	0.298**	0.303**
	(0.032)	(0.031)	(0.046)	(0.044)	(0.132)	(0.135)	(0.119)	(0.121)
ShareSq02*post2003	-0.125***	-0.115***	-0.140**	-0.123*	-0.420**	-0.346*	-0.296*	-0.296*
	(0.046)	(0.043)	(0.066)	(0.064)	(0.196)	(0.199)	(0.171)	(0.171)
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	No	Yes	No	Yes	No	Yes	No	Yes
Observations	15802	15802	15846	15846	15846	15846	15845	15845
R^2	0.016	0.124	0.03	0.069	0.018	0.027	0.012	0.015

Figure 1: Non-parametric Evidence of Performance Changes

Non-parametric estimates of the change in firm performance from 2002 to 2004 plotted against the pre-determined managerial ownership in 2002, using the Epanechnikov kernel with optimal bandwidth based on the formula of Silverman (1986). In Panel A, the vertical-axis is the change in Tobin's Q from 2002 to 2004. In Panel B, the vertical-axis is the change in conditional Tobin's Q from 2002 to 2004, where conditional Tobin's Q is defined as the residual of regressing Tobin's Q on the full set of controls used in the main regression. The grey area shows error bounds, which are 95% confidence intervals (±1.96 standard deviations).

Panel A: Difference in Tobin's Q between 2002 and 2004



Panel B: Difference in Conditional Tobin's Q between 2002 and 2004

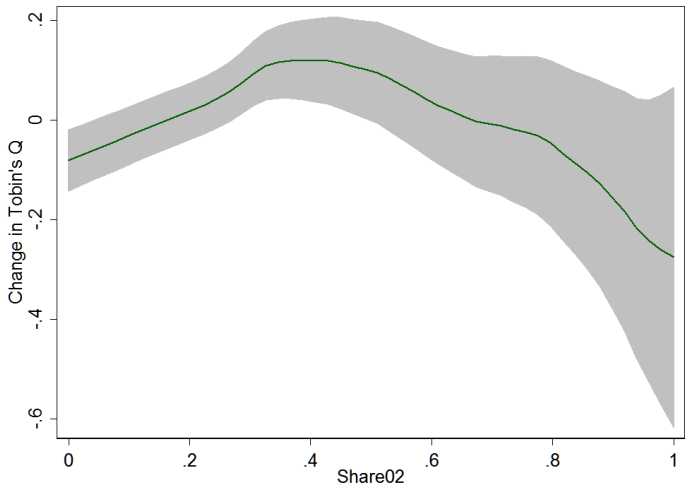
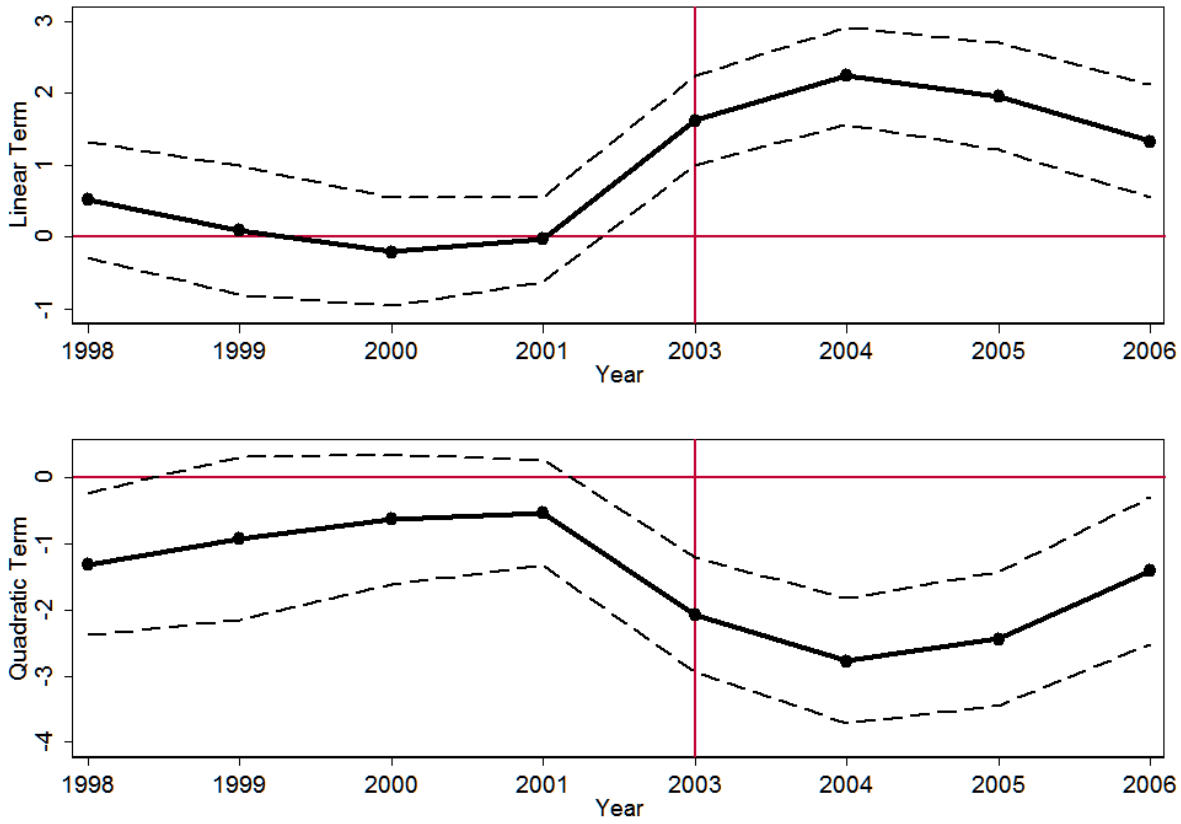


Figure 2: Pre-trend Tests

This figure plots the coefficients for the year-specific linear and quadratic terms of treatment variable following similar specification as in column (4) of Table 5 while extending sample to be from 1998 to 2006, where 2002 is omitted as base year. The error bounds are 95% confidence intervals (±1.96 standard deviations).



8 APPENDIX

Our stylized model follows Chetty and Saez (2010) and Cheng, Hong, and Shue (2013) to illustrate the effect of tax cut on firm value through managerial incentive. Suppose the manager chooses productive investment K, less productive investment J and dividend payout D to maximize his utility

$$\max_{K,G,D} \alpha(1-\tau)\left(D + \frac{f(K)+K+J}{1+r}\right) + \frac{g(J)}{1+r}$$

subject to

$$K + D + J \leq \Gamma$$

where α is the share of managerial ownership, τ is the dividend tax rate, $f(\cdot)$ is the (net) production function for productive investment, $g(\cdot)$ is the private benefit of manager from less productive investment, r is the interest rate, Γ is the cash holding from the firm.

In the maximization problem, the manager allocate the current cash holding into three sources: dividend D , productive investment K and less productive investment J. The objective function of the manager consists of two parts: non-private benefit due to manager's cashflow right which is proportional to effective share $\alpha(1-\tau)$ and private benefit due to manager's control right. Dividend D generates an instant non-private return; productive investment K generates a future public net return of $f(K)$, while the less productive return delay the public return J to the future period and generates private return of $g(J)$.

We make the following assumptions.

Assumption 1. *Both $f(\cdot)$ and $g(\cdot)$ is increasing and concave in its argument. In addition,*

$$f'(0) > r \tag{1}$$

$$g'(0) > r \tag{2}$$

$$g'(0) > f'(\Gamma) \tag{3}$$

Let $w = \alpha(1-\tau)$. Under Assumption 1, we can characterize the manager's behavior as follows:

Proposition 1. *Under Assumption 1, there exists two threshold $\bar{w}_1$ and $\bar{w}_2$ such that*

1. *When $0 \leq w < \bar{w}_1$, $K = D = 0$, $J = \Gamma$.*

2. *When $\bar{w}_1 \leq w < \bar{w}_2$, $D = 0$,$0 < K < K^*$, $J > 0$, with*

$$wf'(K) = g'(\Gamma - K)$$

3. *When $\bar{w}_2 < w < 1$, $D > 0$, $D > 0$,$K = K^*$,$J \geq 0$, with*

$$g'(\Gamma - K^* - D) = wr$$

4. *K^* is determined by*

$$f'(K^*) = r$$

5. *$\bar{w}_1, \bar{w}_2$ are determined by*

$$\begin{aligned} \bar{w}_1 f'(0) &= g'(\Gamma) \\ \bar{w}_2 f'(K^*) &= g'(\Gamma - K^*) \end{aligned}$$

The intuition of the proposition above is as follows. When the effective ownership is very low, gains from private investment outweigh gains from non-private investment or dividend, so manager will invest zero in productive investment. As effective ownership grows above threshold $\bar{w}_1$, managers start to invest positive amount in productive investment, until the productive investment level attains the optimal level K^*. After that, the productive investment stays constant while the

manager chooses between non-private instant dividend D and less productive private investment J.

Following Cheng, Hong, and Shue (2013), we consider both linear and power function of $g(\cdot)$ in the following two propositions.

Proposition 2. *If $g(J) = BJ$, $f(K) = AK^{\gamma}$, $B < (1-\tau)r$ and $\gamma > \frac{1}{2}$, define firm value $V = f(K) + K$, we have the following:*

1. *When $\omega \leq \frac{B}{A\gamma - 1}$, $K = D = 0$, $J = \Gamma, \frac{\partial V}{\partial \tau} = 0$*

2. *When $\frac{B}{A\gamma-1} \leq w < \frac{B}{r}$, $D = 0$, $0 < K < K^*$, $J = \Gamma - K > 0$, with*

$$wf'(K) = B$$

and

$$\frac{\partial^2 V}{\partial \tau \partial \alpha} < 0$$

3. *When $w \geq \frac{B}{r}$, $D = \bar{\Gamma} - K^*$, $K = K^*$, $J = 0$, and $\frac{\partial V}{\partial \tau} = 0$*

Proof. The only thing needing a proof is the second point with $\frac{B}{A\gamma-1} \leq w < \frac{B}{r}$. It is easy to verify that

$$\begin{aligned} K &= \left(\frac{\omega A \gamma}{B}\right)^{\frac{1}{1-\gamma}} \\ \frac{\partial K}{\partial \omega} &= \frac{K}{\omega(1-\gamma)} \end{aligned}$$

so

$$\begin{aligned}
\frac{\partial V}{\partial \omega} &= \left(f'(K)+1\right)\frac{\partial K}{\partial \omega} \\
&= \frac{\gamma f(K)+K}{\omega\left(1-\gamma\right)} \\
\frac{\partial^2 V}{\partial \omega^2} &= \frac{\partial V}{\partial \omega}\left(\frac{\gamma f'(K)+1}{\gamma f(K)+K}\cdot\frac{\partial K}{\partial \omega}-\frac{1}{\omega}\right) \\
&= \frac{\partial V}{\partial \omega}\cdot\frac{1}{\omega\left(1-\gamma\right)\left(\gamma f(K)+K\right)}\cdot\left(\gamma(2\gamma-1)f(K)+\gamma K\right)
\end{aligned}$$

and

$$\frac{\partial^2 V}{\partial \alpha \partial \tau} = -\frac{\partial^2 V}{\partial \omega^2}\cdot\omega - \frac{\partial V}{\partial \omega}$$

so $\frac{\partial^2 V}{\partial \tau \partial \alpha} < 0$ if $\gamma > \frac{1}{2}$. □

Proposition 3. *If* $g(J) = BJ^{\gamma}$, $f(K) = AK^{\gamma}$, $K^* = \left(\frac{A\gamma}{r}\right)^{\frac{1}{1-\gamma}}$ $\frac{K^*}{\Gamma - K^*} > \frac{1+\gamma r}{1+r}$, *define firm value* $V = f(K) + K$, *we have the following:*

1. *When* $\omega \leq \frac{B\Gamma^{\gamma}}{A\gamma}$, $K = D = 0$, $J = \Gamma, \frac{\partial V}{\partial \tau} = 0$

2. *When* $\frac{B\Gamma^{\gamma}}{A\gamma} \leq w < \frac{B\gamma}{r}\left(\Gamma - K^*\right)^{\gamma-1}$,$D = 0, 0 < K < K^* = \left(\frac{A\gamma}{r}\right)^{\frac{1}{1-\gamma}}$, $J = \Gamma - K > 0$, *with*

$$wf'(K) = g'\left(J\right)$$

   and there exists $\bar{\alpha}$*such that*

$$\frac{\partial^2 V}{\partial \tau \partial \alpha} < 0$$

   if and only if

$$\alpha < \bar{\alpha}$$

3. *When* $w \geq \frac{B\gamma}{r}\left(\Gamma - K^*\right)^{\gamma-1}$, $D > 0$, $K = K^*$, $J > 0$, *and* $\frac{\partial V}{\partial \tau} = 0$

Proof. The boundary condition for ω is easy to verify. What needs to show is the second point.

From first order condition, have

$$\frac{K}{\Gamma - K} = \left(\frac{\omega A}{B}\right)^{\frac{1}{1-\gamma}} = C$$

and $K = \frac{C}{1+C}\Gamma$. So

$$\begin{aligned}\frac{\partial C}{\partial \omega} &= \frac{C}{\omega(1-\gamma)} \\ \frac{\partial K}{\partial \omega} &= \frac{K}{\omega(1-\gamma)(1+C)}\end{aligned}$$

and

$$\begin{aligned}\frac{\partial V}{\partial \omega} &= \left(f'(K)+1\right)\frac{\partial K}{\partial \omega} \\ &= \frac{\gamma f(K)+K}{\omega\left(1-\gamma\right)\left(1+C\right)} \\ \frac{\partial^2 V}{\partial \omega^2} &= \frac{\partial V}{\partial \omega}\left(\frac{\gamma f'(K)+1}{\gamma f(K)+K}\cdot\frac{\partial K}{\partial \omega} - \frac{1}{\omega} - \frac{\partial C/\partial \omega}{1+C}\right) \\ &= \frac{\partial V}{\partial \omega}\cdot\left(\frac{1}{(1-\gamma)(1+C)\omega}\left(\frac{\gamma^2 f(K)+K}{\gamma f(K)+K} - C\right) - \frac{1}{\omega}\right)\end{aligned}$$

and

$$\begin{aligned}\frac{\partial^2 V}{\partial \alpha \partial \tau} &= -\frac{\partial^2 V}{\partial \omega^2}\cdot\omega - \frac{\partial V}{\partial \omega} \\ &= -\frac{\partial V}{\partial \omega}\cdot\frac{1}{(1-\gamma)(1+C)}\left(\frac{\gamma^2 f(K)+K}{\gamma f(K)+K} - C\right) \\ &= -\frac{\partial V}{\partial \omega}\cdot\frac{1}{(1-\gamma)(1+C)}\cdot\frac{1}{\gamma f(K)+K}\left((1-C)K + \gamma\left(\gamma - C\right)f(K)\right)\end{aligned}$$

Let $\phi = (1-C)K + \gamma\left(\gamma - C\right)f(K)$. When $\omega = 0$, $C = 0$, $\phi = \gamma^2 f(K) > 0$. When

$\omega = \frac{B\gamma}{r}\left(\Gamma - K^*\right)^{\gamma-1}$, $C = \frac{K^*}{\Gamma - K^*}$, and

$$\begin{aligned}\phi &= (1-C)\,K^* + \gamma\,(\gamma - C)\,f(K^*) \\ &= \left((1+\gamma r) - (1+r)C\right)K^*\end{aligned}$$

with the condition that$C = \frac{K^*}{\Gamma - K^*} > \frac{1+\gamma r}{1+r}$ we have $\phi < 0$.

By Intermediate Value Theorem, there exists an $\bar{\alpha}$ such that $\frac{\partial^2 V}{\partial \tau \partial \alpha} < 0$ if and only if $\alpha < \bar{\alpha}$. $\square$