

CORPORATE GOVERNANCE AND ASPECTS OF PUBLIC POLICY

By

Stephen C. Alford

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Department of Accounting and Finance
I.H. Asper School of Business
University of Manitoba
Winnipeg, Manitoba
Canada R3T 5V4

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ABSTRACT

This dissertation consists of three papers that examine how aspects of public policy may impact private sector corporate governance. The first two examine the relationship between personal-tax policy and corporate agency costs. The first paper is a theoretical analysis based on an agency model of managerial behavior. A unique element of this paper is that it assumes a discontinuous compensation function, which reflects the occurrence of performance thresholds associated with the dismissal incentive and many common bonus plans. The analysis results in three main findings. First, the relative magnitude of proportional taxation has an indeterminate effect on managerial performance. Second, an increase in tax progressivity is associated with reduced managerial performance and increased agency costs. Third, the inclusion of performance thresholds and compensation discontinuities can cause tax system changes to have surprisingly large impacts on managerial performance.

The second paper is an empirical investigation of the relationship between personal-tax progressivity and corporate operating efficiency. The analysis is based on variations in across-state tax policy and utilizes a sample of US-based firms. Using matched-pair testing and regression analysis, evidence is found that is consistent with the hypothesis that increased personal-tax progressivity negatively impacts managerial performance. Together, the analysis contained in the first two papers suggests a need to further examine the relationship between personal taxation and corporate agency costs, an issue that is largely absent from the research literature.

The third paper investigates whether variations in state corporate law affect firm

value. Previous research in this area generally treats all states other than Delaware as having homogeneous corporate law. I relax this assumption and analyze a large panel sample of US firms. Evidence is found that Delaware firms are worth more, on average, than non-Delaware firms. However, this effect is not consistent across all non-Delaware jurisdictions. The valuation differences are correlated to differences in statutory law. Specifically, corporate law that provides greater entrenchment of management is associated with reduced firm value. The results indicate that corporate law does affect corporate governance. Furthermore, the findings are inconsistent with the “race to the bottom” theory of corporate law.

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DEDICATION

I dedicate this work to my parents. Their generosity and work ethic have always been an inspiration to me.

TABLE OF CONTENTS

Abstract	i
Acknowledgements	iii
Dedication	iv
Table of Contents	v
List of Tables	viii
List of Figures	ix

1. General Introduction

1.1. Corporate Governance and Public Policy	1
1.2. Overview of Dissertation: Research Summary and Contribution	2
1.3. Background: Literature Review	6
References	15

2. Tax Policy and Managerial Performance: An Agency Perspective with Performance Thresholds

Abstract	19
2.1. Introduction	20
2.2. An Agency Based Model of Managerial Performance Choice	24
2.3. Preliminary Analysis	25
2.4. Optimization Under Different Tax Regimes	30
2.5. Discussion of Results	34
2.6. Conclusions	41

Appendices	41
References	51
Figures	53
3. Personal Taxation, Corporate Agency Costs and Firm Performance	
Abstract	57
3.1. Introduction	58
3.2. Theoretical Framework: Predicted Effect of Personal-Tax Progressivity on Corporate Agency Costs	61
3.3. Data and Variables	65
3.4. Empirical Analysis: Match Pair Testing and Regression Analysis	72
3.5. Conclusions	84
References	86
Tables	90
4. Corporate Law and Firm Value: Considering the Heterogeneity of “Other States”	
Abstract	95
4.1. Introduction	96
4.2. Prior Research: Cross-Sectional Evidence on the Effect of State Law on Firm Value	101
4.3. Methodology	104
4.4. Firm Value and Legal Domicile	114
4.5. Discussion and Analysis of Robustness	122
4.6. Conclusions	129

References	132
Tables	135
5. General Conclusions	144

LIST OF TABLES

Table 3.1.	Variables information	90
Table 3.2.	Summary statistics for variables	91
Table 3.3.	Matched pair testing: comparison of firms in most progressive tax environment and matched firms in least progressive tax environment	92
Table 3.4.	Regressions of firm performance on personal-tax progressivity and control variables	93
Table 3.5.	Regressions of firm performance on an alternative measure of personal-tax progressivity	94
Table 4.1.	Summary statistics for key variables	135
Table 4.2.	Legal domicile state grouping by model	136
Table 4.3.	Traditional model	137
Table 4.4.	Alternative models	138
Table 4.5.	Comparison of Delaware dummy variable coefficient to other domicile dummy variable coefficients	140
Table 4.6.	Regressions controlling for potential endogeneity caused by selection bias	141
Table 4.7.	Regressions for different firm size categories	142
Table 4.8.	Regressions with an index of corporate law (LEM) as a control variable	143

LIST OF FIGURES

Figure 2.1.	Relationship between performance and utility from non-pecuniary benefits, expected utility from after tax income and total expected utility	53
Figure 2.2.	Relationship between performance and expected utility under t_S and t_B (with parallel shift)	54
Figure 2.3.	Relationship between performance and expected utility of after tax income under t_R and t_P	55
Figure 2.4.	P^* under t_R and t_P	56

CHAPTER 1

GENERAL INTRODUCTION

1.1. Corporate Governance and Public Policy

Corporate governance is the set of mechanisms that are intended to induce self-interested managers to act in the best interests of the firm's shareholders.¹ An optimal system of corporate governance minimizes agency costs, which includes the net cost of suboptimal decision-making by managers and the cost associated with the operation of the corporate governance system itself.² Corporate governance is concerned with the rights and responsibilities that define the relationships among the shareholders, directors and managers of a firm. Public policy can both provide mechanisms of corporate governance and also influence the design and effectiveness of other mechanisms for controlling managerial conflicts of interest.

This dissertation examines how two specific aspects of public policy may influence the nature and effectiveness of corporate governance. The first public policy issue that is examined is tax policy, specifically personal taxation. Since typical forms of compensation are taxable and the compensation system is generally viewed as one of the primary mechanisms of corporate governance, we may reasonably expect that tax policy would influence the design and effectiveness of this mechanism. The second public

¹ Definitions of corporate governance vary considerably, depending on the source. This definition is similar in spirit to that of Shleifer and Vishny (1997) and Denis (2001) and corresponds to the meaning generally applied in the field of financial economics.

² Sub-optimal decision-making is an agency cost if it is motivated by self-interested behavior on the part of the manager. Costs associated with the corporate governance system itself, include the cost of providing managerial incentives and the cost of monitoring manager behavior.

policy area that is examined is the corporate legal environment. Corporate law is itself a mechanism of corporate governance, since it plays a prominent role in establishing and enforcing investor rights.

Developing a clear understanding of how taxation and corporate law can affect corporate governance is important from several perspectives. First, public policy makers need to have a thorough understanding of these and other effects in order to adequately assess the overall impact of policy alternatives. Second, if public policy parameters affect firm costs and operating efficiency, firms and individual investors should consider these parameters when making capital investment decisions. Third, executives and firm directors may need to consider public policy characteristics in order to design efficient internal corporate governance mechanisms (i.e. compensation packages, corporate charter and bylaws, disclosure systems, etc.) that will allow the firm to maintain investor confidence and raise necessary capital. Fourth, financial economists conduct empirical research using inter-jurisdictional samples of firms. Even if these researchers are not specifically concerned with issues of public policy, they need to have an understanding of the relevant public policy factors in order to design appropriate analytical control procedures.

1.2. Overview of Dissertation: Research Summary and Contribution

This dissertation consists of three papers examining how specific aspects of public policy may impact the overall effectiveness of firm corporate governance. The first two papers, contained in Chapters 2 and 3, examine personal taxation. The first paper is a theoretical analysis of how the magnitude and progressivity of personal income

taxes may impact firm agency costs in a model where an agent faces a tradeoff between taxable income and untaxed non-pecuniary benefits. The model is differentiated from previous analyses on the impact of taxation on labor behavior (labor supply or labor productivity) by introducing both a compensation function that includes discontinuities and also imperfect measurement of the employee's action. This also makes the model conditions correspond to certain important realities associated with corporate governance and managerial employment contracts since managerial performance (agency costs) cannot be directly observed and compensation is often not a continuous function of measured performance (there are discontinuities associated with bonus plans and dismissal).

The analysis in the first paper results in three main findings. First, an increase in the magnitude of taxation, assuming a proportional tax, has an indeterminate effect on managerial performance. This should not be interpreted as indicating that there is no effect, only that the nature of the effect cannot be predicted without making more specific assumptions about the manager's utility function. In addition to indicating that the tax level may play a role in determining the equilibrium level of firm agency costs, the analysis also serves as a general warning about the sensitivity of this type of analysis to the model assumptions. Many theoretical analyses in economics and finance assume a specific form of utility function and then test the sensitivity of the results to different utility function parameters.³ The results in the paper show that the assumed form of the utility function can also play an important role in determining the predicted effect. Second, the analysis indicates that an increase in tax system progressivity causes a decline in managerial performance and an increase in firm agency costs. This provides

³ For example, an exponential utility function or a quadratic utility function is often assumed.

an unambiguous theoretical prediction for testing; specifically, it is hypothesized that firms that operate in jurisdictions with higher personal-tax progressivity will have higher agency costs after controlling for other relevant factors. This prediction has not previously been tested and serves as the basis for the empirical work in the second paper (Chapter 3). Third, the analysis shows that incentive systems with compensation discontinuities associated with performance thresholds can result in large managerial performance responses to exogenous changes in tax policy. This indicates a potentially important role of performance thresholds, which have largely been ignored in taxation research on labor behavior.

The second paper (Chapter 3) is an empirical analysis of the relationship between personal-tax progressivity and firm operating efficiency.⁴ To the best of my knowledge, there has been no previously published empirical work that has attempted to assess how personal taxation impacts productivity at the firm level. The methodology consists of both matched pair testing and regression analysis on a cross-section of US-based firms. Evidence is found, based on both methodologies and three separate measures of performance, which indicates a significant negative relationship between personal-tax progressivity and firm performance. This is consistent with the theoretical prediction. While the analytical findings are found to be robust based on a number of sensitivity tests, certain sample limitations (i.e. low variation in the tax parameter) make it impossible to completely preclude the possibility that the main results are driven by a failure to control for relevant location related factors. Overall, the results suggest that firm performance may be negatively related to personal-tax progressivity, however,

⁴ Progressivity is a measure of tax function slope. A tax system is considered progressive if the effective tax rate increases with income; the greater the rate of increase, the more progressive the tax system is considered.

further empirical research is warranted to provide a definitive conclusion.

The third paper (Chapter 4) examines the effect of state corporate law on firm corporate governance. Specifically, it contains an empirical analysis of the relationship between a firm's legal domicile and its overall value. The research to date has focused, with somewhat mixed results, on comparing Delaware and non-Delaware domiciled firms. In this paper, the previous research is extended in two ways. First, an improved methodology is used to reexamine whether Delaware domiciled firms are worth more than non-Delaware firms. Second, the effect of legal domicile is examined without the restrictive grouping assumption used in previous research; specifically, homogeneous corporate law in the "other US states" (the jurisdictions other than Delaware) is not assumed.

Based on firm data from 1990 to 2004 and regression analysis, evidence is found that: (1) Delaware firms are worth more, on average, than non-Delaware firms; (2) Delaware incorporation is valuable relative to some states but not others (however, no substantive evidence is found that Delaware corporate law is inferior to that of any other state); (3) the domicile valuation effect is driven, at least in part, by differences in statutory law, with high entrenchment jurisdictions being harmful to shareholder value; and (4) there may be domicile valuation effects that are driven by factors other than the existence or absence of certain statutes (there may be value associated with the body of case law, the organization of the court system and the expertise of the judiciary).⁵ Overall, the results indicate that corporate law differences between states are significant

⁵ In this context, entrenchment refers to the shielding of management from corporate governance control mechanisms, including hostile takeovers. Poorly performing managers that are highly entrenched are less likely to suffer disciplinary action (i.e. replacement) or suffer it to a lesser extent than similarly performing managers that are less well entrenched.

in terms of their impact on corporate governance.

1.3. Background: Literature Review

1.3.1. Corporate Governance

Although the early literature on corporate governance used different terminology from that commonly used today, discussion of the problems inherent with the separation of ownership and control goes back at least as far as Adam Smith (1776, p. 700), who stated that “The directors of such [joint stock] companies, however, being the managers of other people’s money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own. ...Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company.” This agency problem was later framed in more detail by Berle and Means (1932), who were concerned with the rising prevalence of large corporations with diffuse ownership that insulated managers from the concerns of shareholders.

Agency theory and issues of corporate governance became popular research topics in the 1970’s, with a number of important contributions emerging. Ross (1973) provided one of the first formalized descriptions of the microeconomic foundations of agency theory. Alchian and Demsetz (1972) examined contracting issues within a firm, noted the shirking problem that arises from misaligned interests and discussed many of the issues that have subsequently dominated corporate governance research, including imperfect performance monitoring, labor market discipline of managers, the market for corporate control and issues of efficient compensation design. Jensen and Meckling

(1976) provided an often-cited definition of an agency relationship, formalized the agency cost concept by detailing its components and analyzed the impact of ownership structure on these cost components.⁶

Since its emergence as an important area of study within the field of financial economics, corporate governance research has generally focused on eight inter-related mechanisms for ameliorating the agency problem. These mechanisms are as follows: (1) ownership structure (the nature and extent of equity and debt financing); (2) the board of directors (role, size, composition, etc.); (3) corporate charter and by-law provisions; (4) securities laws and other aspects of the legal environment; (5) compensation arrangements; (6) labor market competition; (7) product market competition; and (8) the market for corporate control. Contributions in the corporate governance literature are summarized and reviewed by Shleifer and Vishny (1997), Denis (2001), Becht, Bolton and Roell (2002) and Dennis and McConnell (2003).

1.3.2. Taxation and Corporate Governance

Much of the research to date on the relationship between taxation and corporate governance has focused on how tax policy may impact one specific mechanism of corporate governance, which is the system of managerial compensation. The impact of personal tax policy on the overall effectiveness of the corporate governance system has largely been ignored – agency costs are often treated as exogenous or non-existent.⁷ For example, Hall and Liebman (2000) analyze the effect that tax rates (corporate, personal

⁶ An agency relationship exists when one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf that involves delegating decision-making authority to the agent (Jensen and Meckling 1976).

⁷ A notable exception is Katuscak (2004), who specifically models the agency cost response to tax changes.

and capital gains rates) have on the composition of executive compensation packages, but they do not consider the extraction of private benefits, which may be thought of as an untaxed form of compensation.⁸ Similarly, Miller and Scholes (1982), Hite and Long (1982), Abowd and Bognanno (1995), Austin, Gaver and Gaver (1998) and Klassen and Mawani (2000) analyze tax effects on compensation design without addressing potential impacts on agency costs associated with the altered incentives. Other research, that specifically analyzes the interaction between tax policy and corporate agency costs, does not examine the taxation of employment income, but rather focuses on other forms of taxation. For example, Desai, Dyck and Zingales (2004) focus on corporate taxes and Arlen and Weiss (1995) and Morck (2004) examine the taxation of dividends.

While there is a paucity of direct research on whether personal taxation affects corporate agency costs, there is a rich literature in the fields of labor and public economics that examine three strands of related research. The first strand of related research is that which examines the labor supply response to taxation. This research is concerned with whether tax policy impacts the amount of labor supplied in an economy (hours worked per period or the labor participation rate). The empirical research in this area has focused on attempting to measure the elasticity of the labor supply with respect to the net of tax share.⁹ While elasticity estimates vary with the methodology, population segment and sample period, the common consensus is that the elasticity is small, but positive; increased taxation reduces the amount of labor provided.¹⁰ In some respects,

⁸ Private benefits include: perquisites; on-the-job leisure; the opportunity cost or “tunnel” corporate resources; intangible benefits (power, prestige, influence); and other uses of corporate resources for personal benefit.

⁹ This is the percentage change in the amount of hours worked given a one percent increase in the portion of income retained by the employee (the income tax rate is reduced by one percent).

¹⁰ Heckman (1993) and Blundell and MaCurdy (1999) provide discussions of the results.

this research issue parallels the taxation-corporate governance issue that is a topic of this dissertation. The labor supply research examines how taxation affects the equilibrium between income and leisure, while this dissertation examines how taxation affects the equilibrium between income (salary, bonuses, etc) and non-pecuniary benefits (agency costs). The fundamental difference is that the former assesses a macroeconomic issue of quantity, the amount of labor supplied in an economy, while the latter is interested in what is primarily a microeconomic issue of quality, the quality of labor supplied by management in a firm.

The second strand of related research is that which is interested in explaining the composition of employee compensation, specifically, the proportion of overall compensation that is in wages and the proportion that is non-wage compensation (associated with various types of benefits).¹¹ One reason for the interest in this issue is that benefits have been a growing share of overall compensation for many years.¹² Oyer (2004) examines a number of factors that affect the non-wage share of overall compensation and finds evidence that increased taxation of wages leads to increased use of untaxed forms of compensation.

The study of the tradeoff between wage and non-wage compensation in an efficient contract is not new and the identification of tax policy as a partial determinant goes back to the work of Rosen (1974), Rice (1966) and Woodbury (1983). If we think of agency costs (which are driven by perquisite consumption, on-the-job leisure, risk avoidance, etc.) as an untaxed form of compensation, we can clearly see that this question

¹¹ In this context, wages are broadly defined to include all taxable income (salary, bonuses, etc.), while non-wage compensation includes benefits such as medical and dental plan coverage. By statute, many types of non-wage compensation are either tax-exempt or tax-advantaged (relative to wages).

¹² Based on Rice (1966), this trend goes back at least to the 1940's. Based on Oyer (2004), the trend is still evident in recent years.

of how taxation affects wage versus non-wage income addresses a similar issue to the taxation-corporate governance issue raised in this dissertation. The obvious difference is that the labor economics research in this area has focused on explicit, often contractual, benefits (dental, medical, pension, etc.) as opposed to less tangible and less observable benefit factors that are of concern in the field of corporate governance.

The third, and most relevant, related strand of economics research is the least well developed. It examines the effect of taxation on labor productivity or worker effort. This potential effect of taxation gained prominence as researchers became interested in explaining the disparity between the elasticity of taxable income (with respect to the net of tax share) and comparable elasticity estimates for labor supply (quantity of labor). This disparity led Feldstein (1995) to conclude that other behavioral responses (changes other than that in the amount of hours worked), such as labor productivity effects, were important potential consequences of tax policy changes. The high elasticity of taxable income relative to that of labor supply has been reinforced by subsequent empirical work;¹³ however, a complete understanding of the nature and extent of these other behavioral responses has yet to be fully developed. Instead, the findings have influenced researchers to place more emphasis on assessing tax policy impacts on aggregate economic measures, such as taxable income or gross domestic product, in order to capture both labor supply and other behavioral responses to taxation.

Feldstein (1999) suggests that workers subject to higher marginal rates of taxation may reduce their taxable income by expending less ‘effort’ (accepting less responsibility, avoiding travel, etc.) and by receiving ‘compensation’ in forms that are untaxed (i.e.

¹³ Gruber and Saez (2002) provide estimates of the taxable income elasticity and review previous work; Hansson (2004) also provides a recent discussion and presents empirical results for Sweden. Blundell and MaCurdy (1999) provide a comprehensive review of labor supply elasticity research.

various types of fringe benefits and perquisites). Although not expressed in the terminology of corporate governance research, it is clear that he is suggesting that individual taxation could impact corporate agency costs. This viewpoint can be modeled within a principal-agent framework, in which firm owners link employee remuneration to some measure of productivity. Since components of the remuneration package are taxable, we would expect that tax policy would play a role in determining the equilibrium level of productivity and the optimal structure of the compensation package.

Despite the intuitive appeal of a relationship between tax policy and labor productivity, there has been limited research specifically directed at this issue. Sandmo (1994) examines tax effects on work effort in a model of promotion and concludes that a variety of factors, including the effective tax rates at both the present income level and at potential higher income levels, are determinants of equilibrium work effort. Andersen and Rasmussen (1999) model tax system effects on wage levels, work effort and unemployment. They find that increasing income tax progressivity may lead to a lower equilibrium level of work effort. Sillamaa (1999) examines work effort responses to taxation in an experimental setting and finds that work effort increases when the top marginal tax rate is reduced to zero. While this past research on tax policy and productivity is conceptually very similar to the issue considered in this dissertation, the theoretical research has not utilized the principal-agent framework and the empirical research has not assessed firm level productivity effects.

1.3.3. Corporate Law and Corporate Governance

There is a general consensus that international differences in the law can have significant impacts on corporate governance.¹⁴ There is, however, no such consensus on the impact of domestic variation in corporate law. In the US, firms can choose to incorporate in any state, regardless of the firm's actual physical location, and each state has its own unique corporate law and court system that determines, at least in part, investor rights.¹⁵ Hence, a firm's incorporation domicile choice is a choice about the legal environment that will govern relations with investors.

Domicile choice freedom and its effect have been fiercely debated for decades (i.e. Cary 1974; Winter 1977; Romano 1985; Back 1990). No clear consensus has emerged about whether the corporate law of some states is substantially superior to that of other states in terms of its effect on firm corporate governance. The early empirical research directed at this issue utilized event study methodology and examined firm stock returns (abnormal returns) associated with reincorporation announcements.¹⁶ The results were mixed, with some studies indicating that the legal domicile does have significant valuation effects and others finding no such evidence of an effect.¹⁷ Unfortunately, the methodology associated with these studies suffers from a number of shortcomings that

¹⁴ A legal environment that provides greater investor protection appears to increase firm value (LaPorta, Lopez-de-Silanes, Shleifer and Vishny (LLSV) 2002; Klapper and Love 2004; Durnev and Kim 2005), decrease the voting premium in dual class equity structures (Zingales 1994; Nenova 2003; Dyck and Zingales 2004) and reduce the cost of capital (Bhattacharya and Daouk 2002; Himmelberg, Hubbard and Love 2004). The legal environment can also affect: (1) ownership structure (LLSV 1998; Himmelberg, Hubbard and Love 2004); (2) cash distribution decisions (LLSV 2000; Dittmar, Mahrt-Smith and Servaes 2003); (3) operating performance (Klapper and Love 2004); and (4) wealth expropriation from minority shareholders (Johnson, LaPorta, Lopez-de-Silanes and Shleifer 2000; Glaeser, Johnson and Shleifer 2001)

¹⁵ While the issue of domestic variation in corporate law is also relevant within the Canadian context (and other contexts), I have chosen to examine the situation in the US due to: (1) greater domestic variation in the law within the US; and (2) more extensive data availability.

¹⁶ Existing firms can, and occasionally do, change their legal domicile by reincorporating to a different state.

¹⁷ Bhagat and Romano (2001) and Bebchuk, Cohen and Ferrell (2002) provide reviews of the evidence.

make interpretation of the results problematic. In particular, the announcement of a planned reincorporation often coincides with other significant news about the firm and its plans for the future.

The more recent research into whether differences in state corporate have significant impacts on firm corporate governance are based on regression analysis of large cross-sectional or panel data samples of firms. The research focuses on Delaware incorporation due to its dominant role in the US system of corporate law; over half of all publicly traded firms are incorporated in Delaware (Daines 2002). The general approach is to categorize firms based on their incorporation domicile with firms domiciled in Delaware grouped into one category and all other US firms grouped together in the non-Delaware category. The analysis then attempts to determine if there are valuation differences between the two groups after controlling for other factors.

Using this approach, Daines (2001) found evidence that firms domiciled in Delaware had a higher value, as measured by Tobin's Q, than non-Delaware firms after controlling for a variety of other factors. Two other empirical studies find evidence that partially disputes the positive valuation effect of Delaware incorporation. Subramanian (2004) extends the work of Daines by making a variety of methodological refinements and reports that no Delaware effect is found to exist for large firms. He also reports that for small firms there is evidence of a positive Delaware effect, but that it only exists in the earlier portion of the sample period. Another study, by Bebchuk and Cohen (2003), treats a Delaware dummy variable as the dependent variable and finds no statistical significance of the coefficient on Tobin's Q - interpreting this result as contradicting

Daines' findings. However, if Delaware incorporation does increase value, the structure of Bebchuk and Cohen's regression test would be subject to an endogeneity problem.¹⁸

In addition to the mixed results, this line of research suffers from a potentially problematic assumption inherent in the empirical methodology; it implicitly assumes that the legal environment in all states other than Delaware is roughly the same.¹⁹ Even if Delaware has the best (or worst) corporate law, which has not been established, treating all other states as equal would obscure a Delaware effect if some states have a body of corporate law that is similar to that of Delaware.

¹⁸ When the direction of hypothesized causation is from A to B, it is standard to treat B as the dependent variable and A as the independent variable. Bebchuk and Cohen (2003) do the opposite, by treating the domicile dummy as the dependent variable. This is not consistent with standard econometric theory and practice, given the hypothesized direction of causality in Daines (2001).

¹⁹ Daines (2001) does recognize that Pennsylvania, Massachusetts and Ohio have corporate law that differentiates these states from other states and does some limited analysis based on this.

References

- Abowd, J., Bognanno, M., 1995. International differences in executive and managerial compensation. In: Freeman, R., Katz, L. (Eds), *Differences and Changes in Wage Structures*. The University of Chicago Press, Chicago, 67-103.
- Alchian, A.A., Demsetz, H., 1972. Production, information costs, and economic organization. *American Economic Review* 62, 777-795.
- Andersen, T.M., Rasmussen, B.S., 1999. Effort, taxation and unemployment. *Economics Letters* 62, 97-103.
- Arlen, J., Weiss, D., 1994. A political theory of corporate taxation. *Yale Law Journal* 105, 325-391.
- Austin, J., Gaver, J., Gaver, K., 1998. The choice of incentive stock options vs. nonqualified options: a marginal tax rate perspective. *Journal of the American Taxation Association* 20, 1-21.
- Bebchuk, L.A., Cohen, A., 2003. Firms' decisions where to incorporate. *Journal of Law and Economics* 46, 383-425.
- Becht, M., Bolton, P., Roell, A.A., 2002. Corporate governance and control. ECGI - Finance Working Paper No. 02/2002.
- Berle, A.A., Means, G.C., 1932. *The Modern Corporation and Private Property*. Macmillan, New York.
- Bhagat, S., Romano, R., 2001. Event studies and the law: part II – empirical studies of corporate law. Yale ICF Working Paper No. 00-33.
- Bhattacharya, U., Daouk, H., 2002. The world price of insider trading. *Journal of Finance* 57, 75-108.
- Black, B.S., 1990. Is corporate law trivial? - a political and economic analysis. *Northwestern University Law Review* 84, 542-597.
- Blundell, R., MaCurdy, T., 1999. Labour supply: a review of alternative approaches. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, Vol. 3A. Elsevier, Amsterdam and New York, 1560-1695.
- Cary, W.L., 1974. Federalism and corporate law: reflections upon Delaware. *Yale Law Journal* 88, 663-707.
- Daines, R., 2001. Does Delaware law improve firm value? *Journal of Financial Economics* 62, 525-558.

- Daines, R., 2002. The incorporation choices of IPO firms. *New York University Law Review* 77, 1559-1610.
- Denis, D.K., 2001. Twenty-five years of corporate governance research ... and counting. *Review of Financial Economics* 10, 191-212.
- Denis, D.K., McConnell, J.J., 2003. International corporate governance. ECGI - Finance Working Paper No. 05/2003.
- Desai, M.A., Dyck, A., Zingales, L., 2004. Theft and taxes. NBER Working Paper W10978.
- Dittmar, A., Mahrt-Smith, J., Servaes, H., 2003. International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative Analysis* 38, 111-133.
- Durnev, A., Kim, E.H., 2005. To steal or not to steal: firm attributes, legal environment, and valuation. *Journal of Finance* 60, 1461-1463.
- Dyck, A., Zingales, L., 2004. Private benefits of control: an international comparison. *Journal of Finance* 59, 537-600.
- Feldstein, M.S., 1995. The effect of marginal tax rates on taxable income: a panel study of the 1986 tax reform act. *Journal of Political Economy* 103, 551-572.
- Feldstein, M.S., 1999. Tax avoidance and the deadweight loss of the income tax. *Review of Economics and Statistics* 81, 674-680.
- Glaeser, E., Johnson, S., Shleifer, A., 2001. Coase versus the Coasians. *Quarterly Journal of Economics* 116, 853-899.
- Gruber, J., Saez, E., 2002. The elasticity of taxable income: evidence and implications. *Journal of Public Economics* 84, 1-32.
- Hall, B., Liebman, J., 2000. The taxation of executive compensation. *Tax Policy and the Economy* 14, 1-44.
- Hansson, A., 2004. Taxpayers responsiveness to tax rate changes and implications for the cost of taxation. Department of Economics Working Paper, Lund University, Lund, Sweden.
- Heckman, J.J., 1993. What has been learned about labor supply in the past twenty years. *American Economic Review* 83, 116-121.

- Himmelberg, C.P., Hubbard, R.G., and Love, I., 2004. Investor protection, ownership, and the cost of capital. World Bank Policy Research Working Paper No. 2834.
- Hite, G.L., Long, M.S., 1982. Taxes and executive stock options. *Journal of Accounting and Economics* 4, 3-14.
- Jensen, M.C., Meckling, W., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.
- Johnson, S., LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., 2000. Tunneling. *American Economic Review* 90, 22-27.
- Katuscak, P., 2004. The impact of personal income taxation on executive compensation. University of Michigan Working Paper, Ann Arbor, MI.
- Klapper, L.F., Love, I., 2004. Corporate governance, investor protection, and performance in emerging markets. *Journal of Corporate Finance* 10, 703-723.
- Klassen, K.J., Mawani, A., 2000. The impact of financial and tax reporting incentives on option grants to Canadian CEOs. *Contemporary Accounting Research* 17, 227-262.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. *Journal of Political Economy* 106, 1113-1155.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2000. Investor protection and corporate governance. *Journal of Financial Economics* 58, 3-27.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2002. Investor protection and corporate valuation. *Journal of Finance* 57, 1147-1170.
- Miller, M.H., Scholes, M.S., 1982. Executive compensation, taxes, and incentives. In: Sharpe, W.F., Cootner, C.M. (Eds.), *Financial Economics: Essays in Honor of Paul Cootner*. Prentice-Hall, Englewood Cliffs, New Jersey, 179-201.
- Morck, R., 2004. How to eliminate pyramidal business groups - the double taxation of inter-corporate dividends and other incisive uses of tax policy. NBER Working Paper No. W10944.
- Nenova, T., 2003. The value of corporate voting rights and control: a cross-country analysis. *Journal of Financial Economics* 68, 325-351.
- Oyer, P., 2004. Salary or benefits? Stanford University Graduate School of Business and NBER Working Paper.
- Rice, R.G., 1966. Skill, earnings and the growth of wage supplements. *American Economic Review* 56, 583-593.

- Romano, R., 1985. Law as a product: some pieces of the incorporation puzzle. *Journal of Law, Economics and Organization* 1, 225-283.
- Rosen, S., 1974. Hedonic prices and implicit markets: product differentiation in pure competition. *Journal of Political Economy* 82, 34-55.
- Ross, S.A., 1973. The economic theory of agency: the principal's problem. *American Economic Review* 63, 134-139.
- Sandmo, A., 1994. The tax they pay may be your own: promotion, taxes and labour supply. *Scandinavian Journal of Economics* 96, 463-479.
- Shleifer, A., Vishny, R., 1997. A survey of corporate governance. *Journal of Finance* 52, 737-783.
- Sillamaa, M.A., 1999. How work effort responds to wage taxation: an experimental test of a zero top marginal tax rate. *Journal of Public Economics* 73, 125-134.
- Smith, A., 1776. *The Wealth of Nations*, Cannon Edition Modern Library, New York, 1937.
- Subramanian, G., 2004. The disappearing Delaware effect. *Journal of Law, Economics and Organization* 20, 32-59.
- Winter, R.K., 1977. State law, shareholder protection and the theory of the corporation. *Journal of Legal Studies* 6, 251-292.
- Woodbury, S.A., 1983. Substitution between wage and nonwage benefits. *American Economic Review* 73, 166-182.
- Zingales, L., 1994. The value of the voting right: a study of the Milan Stock Exchange experience. *Review of Financial Studies* 7, 125-148.

CHAPTER 2

TAX POLICY AND MANAGERIAL PERFORMANCE: AN AGENCY PERSPECTIVE WITH PERFORMANCE THRESHOLDS

Abstract

This paper analyzes how characteristics of the personal income tax system affect managerial performance using a model based on agency theory and a compensation system that contains performance thresholds. The theoretical analysis results in three main findings. First, the relative magnitude of proportional taxation has an indeterminate effect on managerial performance. Second, an increase in tax progressivity is associated with reduced managerial performance. Third, the inclusion of performance thresholds and compensation discontinuities results in an agent expected utility function that may have two local maxima and this can cause tax system changes to have substantial impacts on managerial performance.

JEL Classification: G30, H21, J24

Keywords: corporate governance, personal taxation, agency theory, productivity, thresholds

2.1. Introduction

One of the fundamental issues of interest to tax and public policy researchers is how taxation affects the incentives of employees. Beginning with seminal work of Mirrlees (1971), this issue has generally been cast within the framework of a labor-leisure choice model, in which the only disincentive effect of taxation is on the amount of labor supplied by a worker. Employee productivity has generally been treated as an exogenous parameter. As a result, most of the labor supply empirical research has focused on issues surrounding the quantity of labor supplied in an economy (number of hours worked, labor participation rates, etc.). While productivity impacts would be captured within aggregate measures of income or economic output, there has been limited theoretical and empirical work focused on directly assessing these potential effects of taxation.¹

Analyzing the labor response to taxation as a strict question of labor quantity ignores certain important realities associated with employment. First, most workers face significant barriers to altering the quantity of labor they supply; many employment contracts are based on predetermined or employer determined hours of work. Other workers, such as salaried managers, have discretion over the amount of labor they supply, but their hours of work are often not measured and their income is not a direct function of labor quantity. Second, many employees, particularly managers, have their compensation tied directly to some measure of their productivity. As such, the economic consequences, both for the employee and employer, depends on both the amount of labor provided,

¹ There are notable exceptions. Sandmo (1994) examines tax effects on work effort in a model of promotion. Andersen and Rasmussen (1999) analyze how tax system progressivity may affect work effort and unemployment in a model with two possible levels of effort that are perfectly observed by the firm. Sillamaa (1999) examines work effort responses to taxation in an experimental setting. Katuscak (2004) models marginal tax rate effects on managerial work effort and compensation structure, where incentives are equity based (restricted stock and stock options).

which is often fixed, and the quality of labor provided, which cannot be fixed.

The issue of labor quality has many dimensions and gives employees considerable latitude in terms of their chosen level of productivity. Typical laborers have discretion over their level of effort, which includes considerations such as the speed and care with which they perform their assigned tasks. At more senior levels, such as in management positions, the scope of discretionary decisions increases considerably and the employee can make choices that are completely consistent with the best interests of the firm's shareholders or can deviate slightly or significantly from the optimal decision set. These deviations can be based on personal motives and may include such practices as: shirking; nepotism; excessive risk avoidance; entrenchment; perquisite consumption; theft; empire building; etc. Many decisions faced by employees, in general, and managers in particular, affect both the economic performance of the firm and the personal utility that the employee derives from his or her position with the firm. The interests of the employee and the firm are not perfectly aligned and this is the agency problem faced by firm owners. In recognition of this misalignment of interests, most firms have a system of incentives that is designed to both reward higher productivity employees and also to remove those who do not meet minimum performance standards.

In this paper, I focus on the managerial employee and define performance or productivity within a framework of agency costs.² Each manager, regardless of his or her level, makes decisions regarding a variety of job related factors. Given that there is some optimal decision set (optimal from the point of view of the firm's owners), deviations

² While this paper focuses on the employee manager and this helps guide the discussion and analysis, the results are, at least to some extent, applicable to employees in general. I focus on managers due to the wider scope of decision-making afforded them and the greater emphasis on performance based pay in their employment contracts.

from the optimal levels constitutes the ‘purchase’ of non-pecuniary employment benefits by the manager and results in a net dollar cost to the firm’s owners. This net dollar cost is an agency cost and I define managerial performance in terms of how well the employee controls the agency cost associated with his or her decision set.³ This provides a broad view of performance that encompasses all the factors that are under the manager’s discretion and measures the overall impact of his or her choices. This is important because it reflects what should be of importance to the firm’s owners and what firms should attempt to measure and reward.

In some respects, the traditional labor quantity issue is conceptually similar to the managerial performance issue of interest in this paper. In the former, a worker faces a tradeoff between two sources of utility – taxable labor income and untaxed leisure time. In the latter, the manager also faces a tradeoff between two sources of utility – taxable labor income and untaxed non-pecuniary employment benefits. There are, however, important fundamental differences. First, managerial performance or productivity is much more difficult to determine than labor quantity. While hours of work can be monitored and measured relatively easily, the cost of sub-optimal decision making by managers due to self-interested behavior, the agency cost, cannot be known. Therefore managerial performance can only be approximated using a coarse measure of actual performance. Second, manager income is not necessarily a linear function of measured performance. Often, performance pay is characterized by significant discontinuities associated with certain performance thresholds. Third, the analysis of performance or productivity responses to taxation would obviously need to utilize different empirical

³ In this context, we are specifically dealing with one particular type of agency cost, which is known as the residual loss (as defined by Jensen and Meckling (1976)).

measures than have been traditionally associated with labor supply tax research.

This paper develops and analyzes a simple agency model in order to predict the potential effect that personal taxation has on managerial performance. In the model, a representative employee manager chooses a level of performance to maximize expected utility. Manager performance cannot be perfectly observed and is therefore measured with a zero mean random error. Manager compensation is a discontinuous function of measured performance and is dependent on predetermined performance thresholds.

The analysis results in three main findings. First, an increase in proportional taxation has an indeterminate effect on managerial performance. This result may seem counter-intuitive; we might expect higher taxes to influence employees to derive more of their utility from untaxed non-pecuniary factors, which would increase agency costs and reduce managerial performance. This conclusion, however, cannot be drawn from the model. It is shown that the effect of a tax increase depends on the specific nature of the manager's utility function. Utility functions are identified that show that managerial performance may increase, decrease or remain unchanged in response to an increase in the proportional rate of taxation. This result is directly analogous to the opposing income and substitution effects found in the literature on labor-leisure choice.

Second, the analysis indicates that an increase in tax system progressivity causes a decline in managerial performance and an increase firm agency costs. Third, the analysis shows that incentive systems with compensation discontinuities associated with performance thresholds can result in large managerial performance responses to tax changes. This indicates a potentially important role of performance thresholds, which have largely been ignored in taxation research on labor supply.

The paper is organized as follows. Section 2.2 describes the model and its basic assumptions. The preliminary analysis and model development are contained in Section 2.3. In Section 2.4, the effect of changing income tax characteristics on managerial performance is analyzed. Section 2.5 discusses the results and limitations of the analysis. Section 2.6 concludes.

2.2. An Agency Based Model of Managerial Performance Choice

The employee manager maximizes expected utility (EU), where utility is a function of after tax income, denoted Y , and the net cost of employment related non-pecuniary benefits (agency costs), denoted A . Therefore the employee problem is to

$$\underset{A}{Max} EU(Y, A) \tag{2.1}$$

subject to

$$Y = (1-t)C \text{ and } C = C(A) \tag{2.2}$$

where C is taxable compensation and t is the effective personal income tax rate. I assume an additively separable utility function and, for convenience, will denote utility derived from after tax income as U_Y and utility derived from non-pecuniary benefits as U_A . I further assume positive and diminishing marginal utility associated with both Y and A .

From the firm's perspective, manager quality depends on how well he or she controls agency costs, I therefore denote performance as P and set $P = -A$.⁴ Since the assessment of manager action is imperfect, measured performance, M , is considered an unbiased normally distributed estimate of actual performance such that $M = P + \tilde{\epsilon}$ and $\tilde{\epsilon} \sim N(0, \mathbf{s}^2)$. Employee compensation is a function of measured performance, such that:

⁴ Given that agency costs cannot, by definition, be negative and also cannot exceed the resources available to the firm, performance is a finite variable in the interval $[P_{\min}, P_{\max}]$.

if M exceeds a reward threshold, denoted P_R , $C = W + R$; if M falls short of a punishment threshold, denoted P_L , $C = W - L$; and otherwise, $C = W$. The values of W , R and L are strictly positive. This characterization of the employee compensation function may appear ad hoc; it does, however, capture the discontinuity caused by performance thresholds associated with typical bonus plans and the dismissal incentive. The compensation function is further discussed and justified in Subsection 2.5.3.

2.3. Preliminary Analysis

The focus of the analysis is to determine the level of performance preferred by the manager under different tax regimes. As a starting point I establish a general characterization of the relationship between expected utility and performance. This characterization is important in order to fully understand the implications of the taxation comparative statics analysis contained in Section 2.4.

2.3.1. Utility From Non-Pecuniary Benefits

The utility associated with the cost of non-pecuniary benefit factors, U_A , is a negative function of P with marginal utility that is decreasing (becoming increasingly negative). This relationship flows directly from the assumptions about the utility function and how performance is defined.

$$\frac{dU_A}{dP} < 0 \quad \text{and} \quad \frac{d^2U_A}{dP^2} < 0 \quad (2.3)$$

It should also be noted that in this model the relationship between U_A and P is independent of the taxation function faced by the manager.

2.3.2. Conditional Probability Distribution of Income

Manager income is a random variable that can take on one of three values. In state 1, income (after tax) is $Y_1 = (1 - t(W - L))(W - L)$; in state 2, $Y_2 = (1 - t(W))(W)$; and in state 3, $Y_3 = (1 - t(W + R))(W + R)$. Note that the effective tax rate, t , is denoted as a function of taxable compensation, such that $t = t(C)$. The probability associated with each state depends on the actual performance and can be represented as follows.

$$Q_1(P) = \text{Prob}[M < P_L | P] = \Phi\left(\frac{P_L - P}{s}\right) \quad (2.4)$$

$$Q_2(P) = \text{Prob}[P_L \leq M \leq P_R | P] = 1 - Q_1(P) - Q_3(P) \quad (2.5)$$

$$Q_3(P) = \text{Prob}[M > P_R | P] = 1 - \Phi\left(\frac{P_R - P}{s}\right) \quad (2.6)$$

Where $\Phi(\cdot)$ is the standard normal cumulative distribution function.

Increased performance decreases the probability of having measured performance below the P_L threshold and increases the probability of having measured performance above the P_R threshold. Also, the state probabilities, Q_i , are independent of the taxation function.

2.3.3. Expected Utility of Income

The expected utility associated with after tax income is dependent on the utility that is associated with the three possible compensation levels and their respective probabilities, such that

$$EU_Y = \sum_{i=1}^3 Q_i U_{Y_i} = Q_1(P)U_{Y_1} + (1 - Q_1(P) - Q_3(P))U_{Y_2} + Q_3(P)U_{Y_3} \quad (2.7)$$

and, based on positive marginal utility (and assuming marginal tax rates do not exceed one), it is known that

$$U_{Y_1} < U_{Y_2} < U_{Y_3} \quad (2.8)$$

From equations (2.4) through (2.8) and the known characteristics of $\Phi(\cdot)$, the following relationships can be derived (proofs are shown in Appendix 2.A):

$$\frac{dEU_Y}{dP} > 0 \quad (2.9)$$

$$\frac{d^2EU_Y}{dP^2} > 0 \quad \forall P \in [P_{\min}, P_L] \quad (2.10)$$

$$\frac{d^2EU_Y}{dP^2} < 0 \quad \forall P \in (P_R, P_{\max}] \quad (2.11)$$

Summarizing the above, a graph of EU_Y versus performance will be upward sloping across the entire performance range and the slope will be increasing from P_{\min} to P_L and decreasing from P_R to P_{\max} . What cannot be determined is the slope change pattern that exists between P_L and P_R . Two possible patterns can emerge. The first involves only one inflection point between P_L and P_R . The second possible pattern has three inflection points between P_L and P_R ; the slope is at first increasing, then decreasing, then increasing and then decreasing (continuing to decrease from the third inflection point all the way to P_{\max}). This three-inflection point case is characterized by a curve that has three relatively flat sections (three plateau pattern). This would occur when: (1) there is a sufficient difference between the three state utilities; (2) P_L and P_R are relatively far apart (but not near P_{\min} or P_{\max}); and (3) σ is sufficiently small.

To see why this three-plateau pattern may occur, assume that σ is relatively small and consider the first derivative of EU_Y , which is as follows (see (2.A.1)-(2.A.2) in

Appendix A for the derivation):

$$\frac{dEU_Y}{dP} = \frac{dQ_1}{dP}(\text{negative constant}) + \frac{dQ_3}{dP}(\text{positive constant}) \quad (2.12)$$

In the performance region that is well below P_L , the slope of both Q_1 and Q_3 are near zero (dQ_1/dP is slightly negative and dQ_3/dP is slightly positive), therefore from equation (2.12), a small positive value for dEU_Y/dP and a relatively flat section on the EU_Y curve is expected in the low performance region. Similarly, in the performance region that is in the middle of P_L and P_R , the Q_1 and Q_3 slopes are both near zero creating another relatively flat section of EU_Y curve. Finally, when performance is well above P_R , the Q_1 and Q_3 slopes are near zero and there exists a third relatively flat section of the EU_Y curve. A more intuitive way to think about this is as follows. When performance is in a range that is sufficiently far from both performance thresholds and is measured relatively accurately (σ is small), slight changes in performance do not have much effect on the probabilities of being rewarded or punished. So the expected utility associated with income is relatively insensitive to performance changes in these regions.

2.3.4. Maximizing Overall Expected Utility

The manager will perform at a level that maximizes overall expected utility. This expected utility maximizing level of performance is denoted by P^* . Since total utility is the sum of U_A and U_Y , and U_A is deterministic with respect to P , the overall expected utility is represented by the following relationship:

$$EU = U_A + EU_Y \quad (2.13)$$

The exact structure of the utility functions, U_A and U_Y , has not been specified. This makes the analysis more general, but does not allow for direct optimization using

mathematical techniques. It is however possible to draw general conclusions regarding the relationship between overall expected utility and performance. The first order condition for a local minima or maxima is:

$$\frac{dEU}{dP} = \frac{dU_A}{dP} + \frac{dEU_Y}{dP} = 0 \quad (2.14)$$

Given that dU_A/dP is strictly negative (from (2.3)) and dEU_Y/dP is strictly positive (from (2.9)), a local minima or maxima will occur whenever the absolute value of dU_A/dP equals dEU_Y/dP . The first order condition becomes

$$\left| \frac{dU_A}{dP} \right| = \frac{dEU_Y}{dP} \quad (2.15)$$

Since dU_A/dP is strictly decreasing ($|dU_A/dP|$ is strictly increasing) and dEU_Y/dP is either: (1) increasing then decreasing; or (2) increasing, decreasing, increasing then decreasing, anywhere from zero to four local extremes can be observed (with four local extremes, two minima and two maxima would be observed).⁵

Graphically, the value of P^* can be found by adding together the utility curves U_A and EU_Y . P^* is then found by simply noting the level of performance that is associated with the highest level of total expected utility. An example of this is represented in Figure 2.1.

The shape of the EU curve represented in Figure 2.1, with a global maximum at P^* occurring between P_{\min} and P_{\max} , is one possibility. A second possibility would be a corner solution, where the global maximum lies at either P_{\min} or P_{\max} . One corner

⁵ The pattern of changes in $|dU_A/dP|$ and dEU_Y/dP make it obvious that there can be four extrema (two local maxima) on the EU curve when there are three inflection points on the EU_Y curve. Although less obvious, our assumptions do not preclude the possibility of having two local maxima when the EU_Y curve has one inflection point, nor does it preclude the possibility of having more than two local maxima (although this possibility would generally require unusual third derivative properties of the U_A function). Regardless, the important point for the discussion at hand is that there may be more than one local maxima.

solution is associated with extremely low performance, where agency costs are maximized. The second corner solution is associated with perfect performance, where the net dollar cost to the firm of non-pecuniary benefits is zero. I will consider that corner solutions are an aberration in that I do not expect to see perfectly good or perfectly bad performance, although I do allow for very good or very bad performance. As such, for analysis I concentrate on the normal case where there is one global maximum EU at P^* that lies between P_{\min} and P_{\max} and there may be a second local maximum at P' that also lies between P_{\min} and P_{\max} . If a second local maximum, P' , occurs, it may lie to the left or right of P^* (P' may be less than or greater than P^*).

2.4. Optimization Under Different Tax Regimes

The issue of interest is how the value of P^* will be affected by changes in the tax function. Since non-pecuniary benefits are untaxed, I have set model conditions such that U_A is not affected by the tax function. Therefore, in this model, the tax effect on the relationship between total EU and performance is solely a result of the tax effect on the expected utility associated with after tax income (EU_Y). In Subsection 2.4.1, I examine the effect of an increase in taxation, by analyzing how an increase in the rate of proportional taxation will affect P^* . Then, in Subsection 2.4.2, I examine the effect on performance of an increase in tax system progressivity.

2.4.1. Increase in Proportional Taxation

First, consider that there exists a proportional tax with a constant rate of t_S and the relationship between EU_Y and performance is as characterized in Section 2.3. Now

consider the effect of an increase in proportional taxation to a rate of t_B , such that $t_S < t_B$ and $t_S, t_B \in [0,1)$. With increasing marginal utility of after tax income, the U_Y in all three compensation states will be lower under tax system t_B (U_{Y1}, U_{Y2} and U_{Y3} are lower under t_B than t_S). As the probabilities in equation (2.7) are unaffected, the lower state utilities cause a downward shift in the entire EU_Y curve. If this shift is parallel to the original curve, as shown in Figure 2.2, there is no effect on the value of P^* .

If the downward movement of the EU_Y curve is not exactly parallel (downward shift with some rotation), P^* will move to the left or right depending on the direction of rotation. The analysis indicates, however, that the direction of rotation is indeterminate without making more specific assumptions about the exact nature of the manager's U_Y function.

In Appendix 2.B, three specific utility functions are identified and analyzed. The utility functions each exhibit positive and diminishing marginal utility. They also share the same characteristics in terms of their absolute risk aversion measure (positive and decreasing in Y) and relative risk aversion measure (positive and constant).⁶ The comparative statics analysis shows that despite sharing these characteristics, each utility function is associated with a different tax effect on P^* . Assuming that the manager has the specified logarithmic utility function, the increase in proportional taxation will have no effect on P^* as per Figure 2.2. If the manager has the specified power utility function, the increased tax rate causes P^* to decline. If the manager has the specified asymptotic utility function, the increased tax rate causes P^* to increase.⁷

⁶ The measures of risk aversion are standard Arrow-Pratt measures (Arrow 1970; Pratt 1964).

⁷ Specifying utility functions with constant relative risk aversion, as is done in Appendix 2.B, is not necessary to prove the indeterminate nature of the tax size effect. Both positive and negative impacts on P^*

2.4.2. Increase in Tax System Progressivity

Suppose the effective income tax rate is a function of taxable compensation, such that $t = t(C)$, and consider two possible tax functions $t_R(C)$ and $t_P(C)$ that have the following relationship:

$$t_R(W - L) > t_P(W - L) \quad (2.16)$$

$$t_R(W) = t_P(W) \quad (2.17)$$

$$t_R(W + R) < t_P(W + R) \quad (2.18)$$

Tax function t_P would be considered more progressive than tax function t_R , since, relative to t_R , t_P applies a higher rate of taxation in the high income state and a lower rate of taxation in the low income state.⁸ Note that this does not imply a requirement for t_P to be progressive and t_R to be regressive in an absolute sense, it only defines the two tax system's relative progressivity. Both tax systems could be progressive or regressive in an absolute sense or one tax system could be proportional.

To determine the effect of greater tax system progressivity I examine how the EU_Y curve shifts in response to a change from t_R to t_P . Subtracting the expected utility of after tax income under t_P from the expected utility of after tax income under t_R gives:

$$EU_{Y_R} - EU_{Y_P} = Q_1[U_Y((1-t_R)(W-L)) - U_Y((1-t_P)(W-L))] + Q_3[U_Y((1-t_R)(W+R)) - U_Y((1-t_P)(W+R))] \quad (2.19)$$

By noting the relative magnitudes of the taxes (as per (2.16) and (2.18)) and that U_Y is an increasing function of after tax income, it can be determined that this difference equation

can be demonstrated using sample utility functions with decreasing relative risk aversion or using sample utility functions with increasing relative risk aversion.

⁸ Setting $t_R(W) = t_P(W)$ allows for the analysis of a change in progressivity while controlling, at least in some sense, for the general magnitude of taxation.

takes the following form:

$$EU_{Y_R} - EU_{Y_P} = Q_1(\text{negative constant}) + Q_3(\text{positive constant}) \quad (2.20)$$

When performance is very low, Q_1 approaches one and Q_3 approaches zero. When performance is very high, Q_1 approaches zero and Q_3 approaches one. Given this, it is concluded that the difference in EU_Y will be negative for low levels of performance and positive for high levels of performance. Furthermore, the difference is monotonically increasing in P based on the characteristics of Q_1 and Q_3 ($dQ_1/dP < 0$ and $dQ_3/dP > 0$). The relative magnitude of EU_Y under the two tax systems is represented in the graph in Figure 2.3.

The more progressive tax function is associated with lower EU_Y at high levels of performance and higher EU_Y at low levels of performance. If one were to set the tax function t_R as the base case and consider the consequence of a change to the more progressive tax function t_P , two possible effects on the value of P^* are possible. First, the tax system change may result in a downward shift in the value of P^* . This is a result of the rotation of the EU curve caused by the positive change in EU_Y at low performance levels and the negative change in the EU_Y at high levels of performance. The second possibility is that the clockwise rotation of the EU curve results in the region previously containing the sub optimal P^{\wedge} becoming the region that now contains the global maximum value of performance P^* . This second possibility could be associated with a large downward jump in the value of P^* as illustrated in Figure 2.4.

A modest downward shift in P^* would occur for EU curves that have a single maxima (one local maximum that is also the global maximum) or if P^* initially lies to the left of P^{\wedge} ($P^* < P^{\wedge}$). The large downward jump in the value of P^* , as illustrated in Figure

2.4, can occur for EU curves with more than one local maxima and a P^* that initially lies to the right of P^{\wedge} ($P^* > P^{\wedge}$).

From the analysis, it is expected that a more progressive tax system would be associated with lower performance and higher agency costs. This result is rather intuitive. What is perhaps surprising and significant is that the use of performance thresholds can contribute to the existence of a suboptimal local maxima and that this can lead to much larger performance responses when tax system characteristics are changed.

2.5. Discussion of Results

2.5.1. Tax Level

A possible expectation prior to performing the analysis is that a higher level of personal income tax would be associated with lower performance and higher agency costs. On the surface, higher taxes suggest reduced utility of compensation and a preference for untaxed non-pecuniary benefits. Under my model however, higher proportional taxation has an indeterminate effect. The higher tax reduces the after tax dollar value of both the potential reward for strong performance and the potential punishment for poor performance. However, the utility value of the reward and/or loss could increase, since the manager will be operating in a lower range of after tax compensation where marginal utility is higher. Increased taxation has two opposing effects; the after tax dollar value of the reward and loss is lowered, but the marginal utility of after tax compensation increases. Hence, the indeterminate theoretical effect of higher taxes on performance and agency costs under this model. This should not be interpreted as predicting that the level of personal income tax will have no effect on

manager performance and agency costs. It is quite plausible that one of the two opposing effects may be dominant resulting in some net impact on managerial performance.

This analytical result is analogous to that of the classic labor-leisure choice model in which there are offsetting substitution and income effects. The empirical evidence with respect to labor supply (quantity) elasticity is somewhat mixed. Overall, the substitution effect appears to be dominant, but the net effect is small (Heckman 1993). Also, there can be significant variation in the results depending on the population segment analyzed (see, for instance, Kimmel and Kniesner (1998); Moffitt and Wilhelm (2000); and Triest (1990)). It should be noted that employees have significant barriers in determining their own hours of work and that labor quantity is much more easily monitored than labor quality. As such, the low or zero elasticity observed in much of the labor supply research does not necessarily imply that managerial performance will not be responsive to changes in taxation. Determining the nature of the impact, if any, is an empirical issue for testing

In addition to indicating that the tax level may play a role in determining the equilibrium level of firm agency costs, the results also serve as a general warning about the sensitivity of this type of analysis to the model assumptions. Many theoretical analyses in economics and finance assume a specific form of utility function and then test the sensitivity of the results to changes in the utility function parameters.⁹ The results in this paper show that the assumed form of the utility function can also play an important role in determining the predicted effect. Given the variability of human behavior and preferences, there is merit in avoiding, to the extent practical, making specific assumptions about the form of the utility function. Where a specific form must be

⁹ For example, an exponential utility function or a quadratic utility function is often assumed.

assumed to facilitate analysis, it can be useful to explore the effect of altering the assumed utility function form.

2.5.2. Tax Progressivity

Intuitively, more progressive taxation would seem to reduce one's incentive to work harder. If an employee performs at a higher level and earns pecuniary rewards, his or her total compensation is taxed at a higher level reducing the incentive to work hard. This intuition is confirmed by the model analysis. The manager facing more progressive taxation sees two effects. First, the potential pecuniary rewards are devalued due to the higher tax rate that is faced if compensation were to increase. Second, the potential loss has a smaller impact due to the decrease in the tax rate that is faced if compensation were to decline. In summary, more progressive taxation reduces the pleasure associated with potential wage rewards and decreases the pain associated with potential wage reductions.

In addition to this relatively intuitive finding, the model predicts that the negative impact of greater tax progressivity may be substantial. If performance is measured relatively accurately and there is a substantial difference between the level of measured performance that will result in punishment and the level that will result in a reward, an increase in progressivity may cause a large downward jump in performance rather than a modest downward shift, as might have been anticipated prior to the analysis.

This downward jump can be thought of as a change in strategy. Under the less progressive tax, the manager may feel it is optimal to perform at a high level in order to have a high probability of receiving the reward. If, however, the same manager is suddenly faced with more progressive taxation, the potential reward is devalued and the

potential punishment reduced. The manager may then decide to forego any real chance of receiving the reward and may perform at a low level, just high enough to keep the probability of punishment relatively low.

2.5.3. The Compensation Function

In my model, the assumed relationship between performance and compensation contains discontinuities associated with reward and punishment. This is not consistent with the traditional approach to modeling the pay-performance relationship in much of the agency-based research. The traditional approach is to assume a continuous, often linear, incentive contract (Hart and Holmstrom 1987; Holmstrom and Milgrom 1987; Gibbons 1998; Murphy 1999). Part of the reason for this is the general focus of this literature on senior executives in large publicly traded firms, many of whom have equity based performance incentives (stock options, restricted stock, etc.).

Most managers, however, do not receive stock options and are not granted restricted stock.¹⁰ Furthermore, for managers below the most senior levels, the direct incentive effect of equity-based compensation is questionable, since an individual's performance is likely to have little impact on the firm's stock price. For many managers, productivity is encouraged and rewarded through some form of bonus plan.¹¹ According to Murphy (2001), bonus plans in the U.S. typically contain a performance threshold.

Performance below the threshold is associated with no bonus. Performance above the

¹⁰ In the U.S., where stock option use is extremely popular compared to most countries, recent figures indicate that only about 12% of white collar employees have access to stock option plans (U.S. Department of Labor 2005). Even if one just considers senior executives, the use of equity based incentive systems is not necessarily pervasive internationally. For instance, Murphy (1999) reports that stock options and restricted stock are not typically part of the CEO compensation system in several countries.

¹¹ Survey data from 1,750 small to medium sized manufacturing companies in the U.S. indicated that 79.1% of the firms had a bonus plan (National Association of Manufacturers 2001). A survey of 341 small businesses by Hornsby et. al. (1999) found that 56.1% used bonuses as part of their incentive system.

threshold is rewarded with a bonus equal to a lump sum plus some performance dependent amount up to a specified maximum. While my model uses a more parsimonious reward structure, it does capture the typical compensation discontinuity at the reward threshold.

The punishment aspect of the assumed compensation function is intended to capture the incentive associated with potential dismissal. A manager fired for poor performance is expected to incur a lump sum cost (i.e. the cost of a period of unemployment, the cost of relocating to a new job, etc.). While this dismissal incentive is often omitted from agency-based models of performance, firms do fire employees for poor performance. Annual dismissal rates ranging from two to six percent are commonly found in empirical studies (i.e. Valletta 1997; Knight and Latreille 2000; Fee and Hadlock 2003). It is expected that this potential for dismissal would have some motivational effect on managers.

2.5.4. Partial Equilibrium Approach

The analysis in this paper examines the partial equilibrium effects of taxation, with the compensation function and other factors held constant. Obviously, endogenizing the compensation function and assuming optimal contracting by the firm may provide further useful insights. However, in order to obtain a closed form solution, additional assumptions would be necessary and/or certain complexities (i.e. discontinuous compensation structure, performance measurement error and non-specific utility function form) associated with the existing model would need to be eliminated. This is a drawback of trying to construct a model that allows for compensation adjustments.

Holding the compensation structure fixed may be a reasonable first order approximation. If you consider the dismissal incentive, both the cost to the manager and the dismissal performance threshold are, at least in part, beyond the control of the firm. They depend on the manager's circumstances (qualifications, flexibility to relocate, etc.), the job market and legal standards regarding employment protection. Regarding the wage level and bonus system, many firms set these by benchmarking to other firms based on industry surveys, trade association data or compensation consultant data. Much of the compensation data may be based on employees in other states in the same country or in other countries in the same geographic region.¹² Furthermore, many firms operating in multiple tax jurisdictions offer the same wage and bonus system to all employees in the same job category regardless of their work location. There is also some empirical justification for holding the compensation structure fixed. Studies on the structure of executive compensation by Hall and Liebman (2000) and Katuscak (2004) find little evidence of tax impacts, once the potential effect of arbitrary time trends has been eliminated.¹³

The partial equilibrium analysis suggests that changes in the tax environment can impact managerial performance and, more specifically, that tax progressivity will be positively related to agency costs. In a general equilibrium, the responses of the agent can be mitigated by the action of the principal; specifically, the firm can modify the compensation contract based on changes in the tax environment. It seems relatively

¹² While some unsophisticated adjustment of the wage and bonus plan may be made in light of differential tax environments, there is no literature to indicate that this adjustment would take into account more complex tax considerations such as measures of progressivity.

¹³ Hall and Liebman (2000) examine the effect that changes in corporate and personal tax rates had on the composition of executive compensation (percentage of total compensation from option grants) in the 1980's and early 1990's. Katuscak (2004) examines the relationship between personal marginal tax rates and pay-to-stock-price sensitivity generated by grants of both stock options and restricted stock.

apparent, however, that the firm would not be able to perfectly mitigate the negative performance impact of increased tax progressivity without incurring some added net cost.

Under the compensation system structure presented in this paper, the mitigating response to an increase in tax progressivity might be to increase the size of the bonus such that the manager chooses the same level of performance. While performance is maintained, the firm incurs a net loss in expected profit associated with the revised, more generous, compensation contract. This is clearly a simplistic example, as there are likely to be changes in various elements of the compensation contract, as well as in the equilibrium level of performance. This issue is explored further in Appendix 2.C, in which a general equilibrium model is developed and analyzed. Although the model characteristics are simplified to facilitate analysis, it does serve to confirm the inferences drawn from the partial equilibrium model. The general equilibrium analysis suggests that increased tax progressivity elicits a performance response from the agent, causes the principal to modify the compensation contract and results in a net loss to the principal (higher overall agency costs).

As with all models, the assumed conditions in my model abstract from the complexity of the real world. There may be a variety of factors, in addition to changes in the compensation system, which could moderate the potential managerial performance effects of tax system changes. The level of moderation and the economic implications associated with the mitigating responses are significant issues to consider. Beyond firm efficiency and labor contracting practices and costs, taxes could affect other related factors such as organizational structure and investment levels. These issues are outside the scope of this paper, but are the types of questions implicitly raised by the partial

equilibrium findings.

2.6. Conclusions

It is extremely common to attempt to align the performance incentives of managers with the interests of the firm's owners by using incentives that are taxable. As such, we should expect that the nature of the tax system would have some impact on productivity and/or on the design of incentive systems. There has been little effort, however, to directly assess the potential productivity effects of taxes within a framework that takes into account performance measurement limitations and compensation discontinuities associated with common employment contracting practices.

Overall, the analysis strongly suggests that personal-tax system characteristics impact managerial performance. More specifically, the analysis indicates: that tax progressivity is negatively related to managerial performance; that the level of taxation has an indeterminate effect on performance, with the nature of the impact dependent on the agent's assumed utility function; and that the existence of performance thresholds and compensation discontinuities can lead to large performance responses as a result of changes in exogenous tax parameters. The theoretical findings point to a need for empirical research to directly assess how personal tax policy may impact firm efficiency and contracting practices.

Appendices

Appendix 2.A

This appendix contains proofs of equations (2.9) –(2.11).

Differentiating equation (2.7):

$$\frac{dEU_Y}{dP} = \frac{dQ_1}{dP}(U_{Y_1} - U_{Y_2}) + \frac{dQ_3}{dP}(U_{Y_3} - U_{Y_2}) \quad (2.A.1)$$

From equation (2.8), $(U_{Y_1} - U_{Y_2}) < 0$ and $(U_{Y_3} - U_{Y_2}) > 0$. Also, from equations (2.4) and (2.6) and the first derivative properties of $\Phi(\cdot)$, $dQ_1/dP < 0$ and $dQ_3/dP > 0$.

Therefore, the terms in (2.A.1) can be signed as follows:

$$\frac{dEU_Y}{dP} = (-)(-) + (+)(+) > 0 \quad (2.A.2)$$

Q.E.D. for equation (2.9).

Differentiating (2.A.1):

$$\frac{d^2EU_Y}{dP^2} = \frac{d^2Q_1}{dP^2}(U_{Y_1} - U_{Y_2}) + \frac{d^2Q_3}{dP^2}(U_{Y_3} - U_{Y_2}) \quad (2.A.3)$$

As above, from equations (2.8), (2.4) and (2.6) and based on the second derivative properties of $\Phi(\cdot)$ in the interval $[P_{\min}, P_L)$, $d^2Q_1/dP^2 < 0$ and $d^2Q_3/dP^2 > 0$, the terms in (2.A.3) can be signed as follows:

$$\frac{d^2EU_Y}{dP^2} = (-)(-) + (+)(+) > 0 \quad \forall P \in [P_{\min}, P_L) \quad (2.A.4)$$

Q.E.D. for equation (10).

Similarly, based on the second derivative properties of $\Phi(\cdot)$ in the interval $(P_R, P_{\max}]$, $d^2Q_1/dP^2 > 0$ and $d^2Q_3/dP^2 < 0$, the terms in (2.A.3) can be signed as follows:

$$\frac{d^2EU_Y}{dP^2} = (+)(-) + (-)(+) < 0 \quad \forall P \in (P_R, P_{\max}] \quad (2.A.5)$$

Q.E.D. for equation (2.11).

Appendix 2.B

It is apparent that an increase in proportional taxation will be associated with a downward shift in EU_Y since after tax income is lower at each possible level of compensation. How this downward shift affects the value of P^* depends on whether the shift is parallel (constant difference between original and new expected utility curves) or is characterized by downward movement accompanied by rotation. Parallel movement of the expected utility curve will have no effect on the value of P^* . Downward movement with clockwise rotation, where the difference in the EU_Y curves increases as P increases, will result in a reduced value for P^* . Downward movement with counter clockwise rotation, where the difference in EU_Y curves declines as P increases, will result in an increased value for P^* . I consider three utility functions that share the following characteristics: (1) positive marginal utility ($dU/dY > 0$); (2) decreasing marginal utility ($d^2U/dY^2 < 0$); (3) positive absolute risk aversion that is decreasing with increases in Y ; and (4) positive and constant relative risk aversion.

To analyze the type of shift that results from increasing the proportional tax rate from t_S to t_B , first consider the following equation that represents the difference between the EU_Y under t_S and EU_Y under t_B .

$$\begin{aligned}
 EU_{Y_{t_S}} - EU_{Y_{t_B}} = & Q_1 [U_Y((1-t_S)(W-L)) - U_Y((1-t_B)(W-L))] \\
 & + (1-Q_1-Q_3) [U_Y((1-t_S)W) - U_Y((1-t_B)W)] \\
 & + Q_3 [U_Y((1-t_S)(W+R)) - U_Y((1-t_B)(W+R))]
 \end{aligned} \tag{2.B.1}$$

Example 1 - Log Utility Function: $U_Y = \ln(Y)$

Substituting into (2.B.1) to obtain:

$$\begin{aligned}
EU_{Y_{IS}} - EU_{Y_{IB}} &= Q_1 [\ln((1-t_S)(W-L)) - \ln((1-t_B)(W-L))] \\
&\quad + (1-Q_1-Q_3) [\ln((1-t_S)W) - \ln((1-t_B)W)] \\
&\quad + Q_3 [\ln((1-t_S)(W+R)) - \ln((1-t_B)(W+R))]
\end{aligned} \tag{2.B.2}$$

Expanding the logarithmic terms

$$\begin{aligned}
EU_{Y_{IS}} - EU_{Y_{IB}} &= Q_1 [\ln(1-t_S) + \ln(W-L) - \ln(1-t_B) - \ln(W-L)] \\
&\quad + (1-Q_1-Q_3) [\ln(1-t_S) + \ln(W) - \ln(1-t_B) - \ln(W)] \\
&\quad + Q_3 [\ln(1-t_S) + \ln(W+R) - \ln(1-t_B) - \ln(W+R)]
\end{aligned} \tag{2.B.3}$$

Simplifying,

$$EU_{Y_{IS}} - EU_{Y_{IB}} = \ln(1-t_S) - \ln(1-t_B) \tag{2.B.4}$$

The difference is constant and the shift is parallel, resulting in no effect on the value of P^* .

Example 2 - Power Utility Function: $U_Y = (Y)^b$, where $0 < b < 1$

Substituting into (2.B.1), to obtain:

$$\begin{aligned}
EU_{Y_{IS}} - EU_{Y_{IB}} &= Q_1 [((1-t_S)(W-L))^b - ((1-t_B)(W-L))^b] \\
&\quad + (1-Q_1-Q_3) [((1-t_S)W)^b - ((1-t_B)W)^b] \\
&\quad + Q_3 [((1-t_S)(W+R))^b - ((1-t_B)(W+R))^b]
\end{aligned} \tag{2.B.5}$$

Take the derivative (of (2.B.5)) with respect to P ,

$$\begin{aligned}
\frac{d(EU_{Y_{IS}} - EU_{Y_{IB}})}{dP} &= \frac{dQ_1}{dP} [((1-t_S)(W-L))^b - ((1-t_B)(W-L))^b] \\
&\quad + \left(-\frac{dQ_1}{dP} - \frac{dQ_3}{dP} \right) [((1-t_S)W)^b - ((1-t_B)W)^b] \\
&\quad + \frac{dQ_3}{dP} [((1-t_S)(W+R))^b - ((1-t_B)(W+R))^b]
\end{aligned} \tag{2.B.6}$$

$$\begin{aligned}
&= \frac{dQ_1}{dP} [((1-t_S)^b - (1-t_B)^b) ((W-L)^b - W^b)] \\
&\quad + \frac{dQ_3}{dP} [((1-t_S)^b - (1-t_B)^b) ((W+R)^b - W^b)]
\end{aligned} \tag{2.B.7}$$

Noting that $((1-t_S)^b - (1-t_B)^b) > 0$; $(W-L)^b < W^b < (W+R)^b$; and from equations (2.4) and (2.6) and the first derivative properties of $\Phi(\cdot)$, $dQ_1/dP < 0$ and $dQ_3/dP > 0$, the terms in (2.B.7) can be signed as follows:

$$\frac{d(EU_{Y_{tS}} - EU_{Y_{tB}})}{dP} = (-)(+)(-) + (+)(+)(+) > 0 \quad (2.B.8)$$

As such, the difference is increasing as P increases. Therefore the downward shift in the EU_Y curve is accompanied by clockwise rotation and the value of P^* will decline.

Example 3 - Asymptotic Utility Function: $U_Y = a - (Y)^{-b}$, where $b > 1$

Substituting into (2.B.1), to obtain:

$$\begin{aligned} EU_{Y_{tS}} - EU_{Y_{tB}} = & Q_1 \left[a - ((1-t_S)(W-L))^{-b} \right] - \left[a - ((1-t_B)(W-L))^{-b} \right] \\ & + (1-Q_1-Q_3) \left[a - ((1-t_S)W)^{-b} \right] - \left[a - ((1-t_B)W)^{-b} \right] \\ & + Q_3 \left[a - ((1-t_S)(W+R))^{-b} \right] - \left[a - ((1-t_B)(W+R))^{-b} \right] \end{aligned} \quad (2.B.9)$$

Take the derivative (of (2.B.9)) with respect to P ,

$$\begin{aligned} \frac{d(EU_{Y_{tS}} - EU_{Y_{tB}})}{dP} = & \frac{dQ_1}{dP} \left[-((1-t_S)(W-L))^{-b} + ((1-t_B)(W-L))^{-b} \right] \\ & + \left(-\frac{dQ_1}{dP} - \frac{dQ_3}{dP} \right) \left[-((1-t_S)W)^{-b} + ((1-t_B)W)^{-b} \right] \\ & + \frac{dQ_3}{dP} \left[-((1-t_S)(W+R))^{-b} + ((1-t_B)(W+R))^{-b} \right] \end{aligned} \quad (2.B.10)$$

$$\begin{aligned} = & \frac{dQ_1}{dP} \left[-(1-t_S)^{-b} + (1-t_B)^{-b} \right] \left[(W-L)^{-b} - W^{-b} \right] \\ & + \frac{dQ_3}{dP} \left[-(1-t_S)^{-b} + (1-t_B)^{-b} \right] \left[(W+R)^{-b} - W^{-b} \right] \end{aligned} \quad (2.B.11)$$

Noting that $(-(1-t_S)^{-b} + (1-t_B)^{-b}) > 0$; $(W-L)^b > W^b > (W+R)^b$; and from equations (2.4) and (2.6) and the first derivative properties of $\Phi(\cdot)$, $dQ_1/dP < 0$ and $dQ_3/dP > 0$,

the terms in (2.B.11) can be signed as follows:

$$\frac{d(EU_{y_{IS}} - EU_{y_{IB}})}{dP} = (-)(+)(+) + (+)(+)(-) < 0 \quad (2.B.12)$$

As such, the difference is decreasing as P increases. Therefore the downward shift in the EU_Y curve is accompanied by counterclockwise rotation and the value of P^* will increase.

Appendix 2.C

To investigate the general equilibrium response to an increase in tax progressivity, a simple model is set up that allows for optimizing behavior on the part of both the principal and the agent. The following is based on a standard principal-agent model, sometimes called an optimal sharing model, in which agent action can only be inferred from the profit outcome and compensation is a linear function of this outcome.¹⁴ This analysis deviates from the typical set-up by introducing personal taxation of employment income. It should also be noted that the model described below differs from that used in the main body of this paper. The altered assumptions make the model more tractable; it is presented to confirm the intuition about the general equilibrium effects of a change in tax progressivity.

Let a represent the effort of the agent and \tilde{x} be the output measured in dollars, such that $\tilde{x} = a + \tilde{\epsilon}$ and $\tilde{\epsilon} \sim N(0, \mathbf{s}^2)$.¹⁵ The agent has an exponential utility function, $u(w) = -e^{-rw}$, where r is a positive constant representing the agent's absolute risk

¹⁴ This is based on a simple representation of Holmstrom and Milgrom's (1987) model, but is similar in many respects to optimal sharing models described by others (i.e. Mirrlees (1976) and Murphy (1999)). Varian (1992) provides a good summary of the model and I follow similar notation.

¹⁵ In this context, effort, denoted a , can be thought of as a measure of how well the agent controls residual losses and $\tilde{\epsilon}$ can be thought of as a random error in the measurement of the agent's true effort. In this respect, the model is very similar to the one presented in the main body of this paper.

aversion and w is net-of-tax wealth derived from employment income. The compensation contract is linear such that the pretax income is $\mathbf{d} + \mathbf{g}\tilde{x}$. The non-variable component of compensation, \mathbf{d} , is assumed to be fixed and is taxed at a rate T . The variable component, $\mathbf{g}\tilde{x}$, is subject to a constant marginal tax rate of $T+P$. Hence, $w = \mathbf{d}(1-T) + \mathbf{g}\tilde{x}(1-T-P)$ or $w = \mathbf{d}(1-T) + \mathbf{g}(a + \tilde{\epsilon})(1-T-P)$. Since the expected net-of-tax wealth is normally distributed, the expected utility derived from w can be represented by a linear function of the mean and variance of w , which is a monotonic transformation of the expected utility. This transformed value function is $\bar{w} - \frac{r}{2} \mathbf{s}_w^2$.¹⁶ The disutility or cost of effort to the agent is represented by a convex function $c(a)$. The agent problem, then, is to maximize expected utility as represented by the following:

$$\max_a \quad \mathbf{d}(1-T) + \mathbf{g}(1-T-P)a - \frac{\mathbf{g}^2(1-T-P)^2 r}{2} \mathbf{s}^2 - c(a) \quad (2.C.1)$$

This gives the following first order condition for maximization¹⁷

$$\mathbf{g}(1-T-P) = c'(a) \quad (2.C.2)$$

The principal is assumed to be risk neutral and maximizes the expected profit subject to two constraints. The first constraint is that the agent's reservation utility (\hat{u}) must be met. The second constraint is known as the incentive compatibility constraint, which is the recognition that the agent will maximize his or her expected utility based on the terms of the compensation contract. This second constraint is simply the first order condition derived from the agent's optimization problem. The principal's problem can

¹⁶ Varian (1992) provides a brief description of this transformation. Tobin (1958) and Samuelson (1970) provide more detailed expositions.

¹⁷ Although not shown, the second order condition has been checked to confirm that the first order condition corresponds to a maximum.

then be represented by the following:

$$\max_{\mathbf{g}} a - \mathbf{d} - \mathbf{g}a \quad (2.C.3)$$

subject to

$$\mathbf{d}(1-T) + \mathbf{g}(1-T-P)a - \frac{\mathbf{g}^2(1-T-P)^2 r}{2} \mathbf{s}^2 - c(a) \geq \hat{u}, \text{ and} \quad (2.C.4)$$

$$\mathbf{g}(1-T-P) = c'(a). \quad (2.C.5)$$

In order to analyze this constrained optimization problem, it is convenient to set up a Lagrangian equation and solve for the first order conditions as follows:

$$\begin{aligned} L(\mathbf{g}, I_1, I_2) = & a - \mathbf{d} - \mathbf{g}a \\ & - I_1 \left[\mathbf{d}(1-T) + \mathbf{g}(1-T-P)a - \frac{\mathbf{g}^2(1-T-P)^2 r}{2} \mathbf{s}^2 - c(a) - \hat{u} \right] \\ & - I_2 [\mathbf{g}(1-T-P) - c'(a)] \end{aligned} \quad (2.C.6)$$

$$\frac{dL}{d\mathbf{g}} = -a - I_1 [(1-T-P)a - \mathbf{g}(1-T-P)^2 r \mathbf{s}^2] - I_2 [1-T-P] = 0 \quad (2.C.7)$$

$$\frac{dL}{dI_1} = \mathbf{d}(1-T) + \mathbf{g}(1-T-P)a - \frac{\mathbf{g}^2(1-T-P)^2 r}{2} \mathbf{s}^2 - c(a) - \hat{u} = 0 \quad (2.C.8)$$

$$\frac{dL}{dI_2} = -\mathbf{g}(1-T-P) + c'(a) = 0 \quad (2.C.9)$$

First, assume that the system is in equilibrium at time zero and that the level of effort is a_0^* . Then assume that there is an unexpected increase in tax progressivity, such that P_0 increases to P_1 . Temporarily, assume that the compensation function is fixed and that only the agent responds to the new exogenous conditions. The new optimizing level of effort for the agent is based on the first order condition represented by equation (2.C.2). The increase in P causes the right hand side of the equation to decrease, which must be matched by a decrease in the left side. This can only be achieved by a decrease

in a to a new level, denoted \tilde{a}_1 (since $c(a)$ is convex, a decrease in a results in a decrease in $c'(a)$). This is consistent with the partial equilibrium findings of the model analyzed in the main body of this paper. I conclude based on both models that, holding the compensation function fixed, an increase in tax progressivity is expected to decrease managerial effort or performance.

In a general equilibrium, the change in the exogenous parameter P , will elicit responses from both the agent and the principal. With a change from P_0 to P_1 , an adjustment in the effort level from a_0^* to \tilde{a}_1 would satisfy the agent's optimization problem (assuming no response from the principal) and it would also satisfy the principal's first order condition represented by equation (2.C.9). This does not, however, satisfy the principal's first order conditions represented by equations (2.C.7) and (2.C.8). In order to satisfy all three first order conditions, the new level of progressivity must be accompanied by new equilibrium levels of the agent's profit share and effort, represented by g_1^* and a_1^* .

One can make inferences about the comparative statics by examining the constraints. Equation (2.C.4) is based on the reservation utility constraint. It states that at time 0, the principal must set the agent's profit share level at g_0^* , such that the reservation utility requirement will be met. Any exogenous increase in progressivity, P , decreases the expected utility at all fixed levels of a and g .¹⁸ Since the expected utility

¹⁸ I assume that: (1) the level of taxation and g are both bounded at $[0,1]$; (2) a is strictly positive; and (3) \mathbf{s}^2 is small relative to a (specifically, $\mathbf{s}^2 < a/(rg(1-T-P))$). The third assumption is necessary to ensure that the probability of a negative overall payout approaches zero, which, along with the first two assumptions, conforms to real world expectations. With these assumptions, it is possible to conclude that a higher profit share and lower tax progressivity are strictly preferred by the agent, respectively, over a lower

strictly declines at all levels of a , it is apparent that the reservation utility requirement can no longer be met (assuming that (2.C.4) represents a binding constraint), regardless of the effort level chosen by the agent. The only parameter the principal can adjust to make up for this shortfall in expected utility is the agent's profit share and the change in g must be positive to increase the set of expected utility values that can be achieved by the agent.

Although the system of equations represented by (2.C.7) through (2.C.9) is non-linear and, therefore, does not lend itself to a mathematical analysis of the variable properties, these properties can be investigated using an iterative computational algorithm. I solve the constrained maximization problem using the generalized reduced gradient method (Lasdon and Waren 1982), also known as the GRG2 method. A wide variety of parameter values were tested by inputting the values into the problem and using the algorithm to calculate the optimal profit share, g^* , along with the associated level of agent effort, a^* , and resulting expected profit for the principal. The effect of an incremental increase in tax progressivity, P , is then calculated. For each feasible parameter set, it was found that $dg/dP > 0$ and that $dE(Profit)/dP < 0$. Higher progressivity results in a higher profit share for the agent and a lower level of expected profit for the principal.¹⁹ This corresponds to the implication drawn from the partial equilibrium model in the main body of this paper; the net effect of increased personal-tax progressivity is an increase in agency costs.

profit share and a higher tax progressivity. It is reasonable to expect that for a given level of effort, agents prefer conditions that increase the after-tax payout they would receive in all feasible states of nature.

¹⁹ I assume the disutility function is of the form, $c = (sa)^k$, where $s > 0$ and $k > 1$. A parameter set is considered feasible if it results in a unique solution to the problem described by equations (2.C.3)–(2.C.5) and meets the additional constraints noted in the previous footnote. Although it is not possible to investigate every feasible parameter set, a wide variety of feasible parameter sets were tested with consistent results.

References

- Andersen, T.M., Rasmussen, B.S., 1999. Effort, taxation and unemployment. *Economics Letters* 62, 97-103.
- Hall, B., Liebman, J., 2000. The taxation of executive compensation. *Tax Policy and the Economy* 14, 1-44.
- Heckman, J.J., 1993. What has been learned about labor supply in the past twenty years. *American Economic Review* 83, 116-121.
- Holmstrom, B., Milgrom, P., 1987. Aggregation and linearity in the provision of intertemporal incentives. *Econometrica* 55, 303-328.
- Jensen, M.C., Meckling, W., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.
- Katuscak, P., 2004. The impact of personal income taxation on executive compensation. University of Michigan Working Paper, Ann Arbor, MI.
- Lasdon, L., Waren, A.D., 1982. Large scale nonlinear programming. *Computer and Chemical Engineering* 7, 595-604.
- Mirrlees, J.A., 1976. The optimal structure of incentives and authority within an organization. *Bell Journal of Economics* 7, 105-131.
- Murphy, K.J., 1999. Executive Compensation. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, Vol. 3B. North Holland, Amsterdam, 2485-2563.
- Murphy, K.J., 2001. Performance standards in incentive contracts. *Journal of Accounting and Economics* 30, 245-278.
- Samuelson, P.A., 1970. The fundamental approximation theorem of portfolio analysis in terms of means, variances and higher moments. *Review of Economic Studies* 37, 537-542.
- Sandmo, A., 1994. The tax they pay may be your own: promotion, taxes and labour supply. *Scandinavian Journal of Economics* 96, 463-479.
- Sillamaa, M.A., 1999. How work effort responds to wage taxation: an experimental test of a zero top marginal tax rate. *Journal of Public Economics* 73, 125-134.
- Tobin, J., 1958. Liquidity preference as behavior towards risk. *Review of Economic Studies* 25, 65-86.
- Varian, H.R., 1992. *Microeconomic Analysis*. 3rd edition. W.W. Norton & Company, New

York.

- Arrow, K.J., 1970. *Essays in the Theory of Risk Bearing*. Markham Publishing, Chicago.
- Fee, C.E., Hadlock, C.J., 2003 Raids, rewards and reputations in the market for managerial talent. *Review of Financial Studies* 16, 1315-1357.
- Gibbons, R.S., 1998. Incentives in organizations. *Journal of Economic Perspectives* 12, 115-132.
- Hart, O.D., Holmstrom, B.R., 1987. The theory of contracts. In: Bewley, T.F. (Ed.), *Advances in Economic Theory*. Cambridge University Press, Cambridge, 71-155.
- Hornsby, J.S., Kuratko, D.F., LaFollette, W.R., Hodgetts, R.M., Cox, L.R., 1999. A study of human resources practices and trends in U.S. small businesses. *Proceedings of the US Association for Small Business and Entrepreneurship Annual National Conference*.
- Kimmel, J. Kniesner, T.J., 1998. New evidence on labor supply: employment versus hours elasticities by sex and marital status. *Journal of Monetary Economics* 42, 289-301.
- Knight K.G., Latreille P.L., 2000. Discipline, dismissals and complaints to employment tribunals. *British Journal of Industrial Relations* 38, 533-556.
- Mirrlees, J.A., 1971. An exploration in the theory of optimum income taxation. *Review of Economic Studies* 38, 175-208.
- Moffitt R.A., Wilhelm, M.O., 2000. Taxes and labor supply decisions of the affluent. In: Slemrod, J. (Ed.), *Does Atlas Shrug? The Economic Consequences of Taxing the Rich*. Russell Sage Foundation, New York, 193-234.
- National Association of Manufacturers, 2001. *Small manufacturers operating survey*. <http://www.nam.org/>.
- Pratt, J.W., 1964. Risk aversion in the small and in the large. *Econometrica* 32, 122-136.
- Triest, R.K., 1990. The effect of income taxation on labor supply in the United States. *Journal of Human Resources* 25, 491-516.
- U.S. Bureau of Labor Statistics, 2005. *National compensation survey: employee benefits in private industry in the United States, 2002-2003*. Bulletin 2573. U.S. Department of Labor, Washington, D.C.
- Valletta, R.G., 1999. Declining job security. *Journal of Labor Economics* 17, S170-197.

Figure 2.1.
Relationship between performance and utility from non-pecuniary benefits, expected utility from after tax income and total expected utility

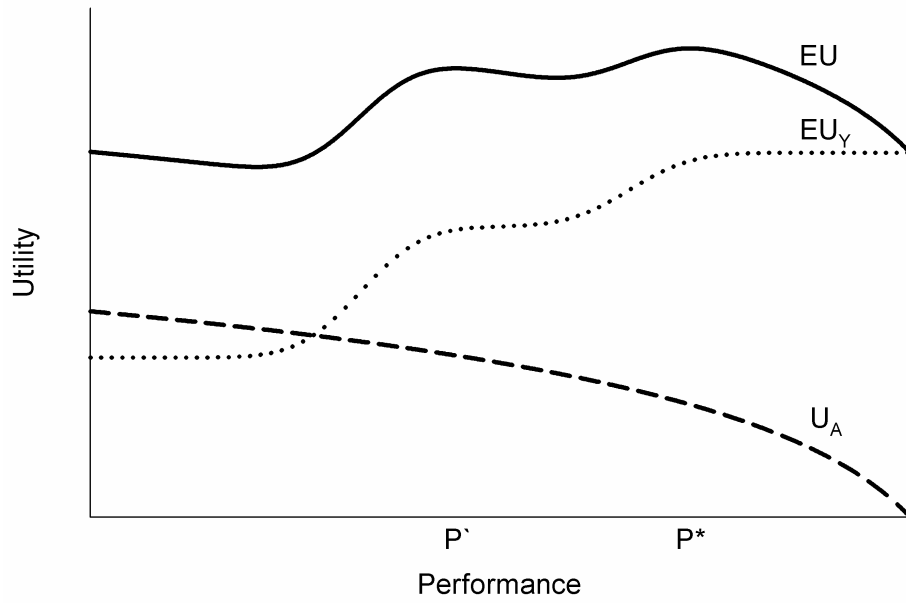


Figure 2.2.
Relationship between performance and expected utility under t_S and t_B (with parallel shift)

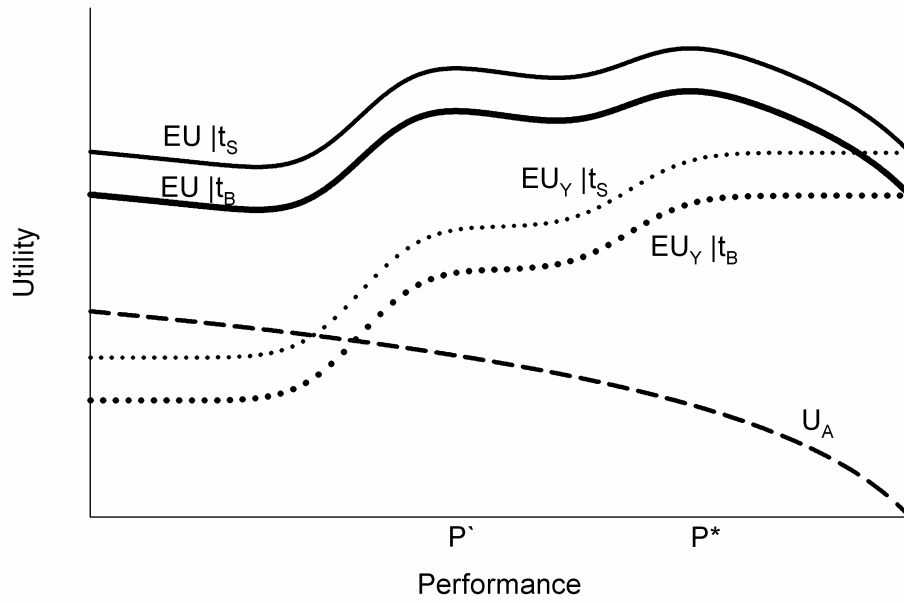


Figure 2.3.
Relationship between performance and expected utility of after tax income under t_R and t_P

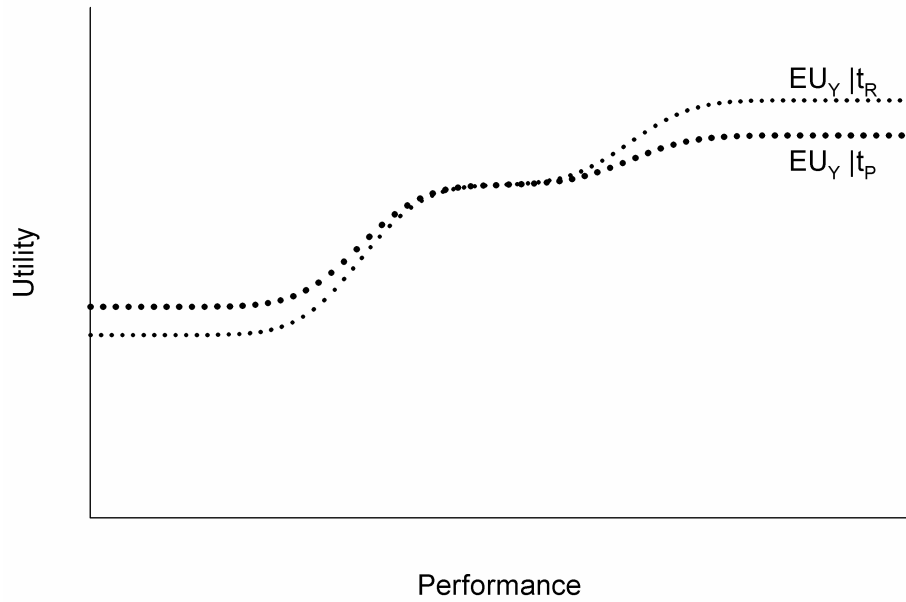
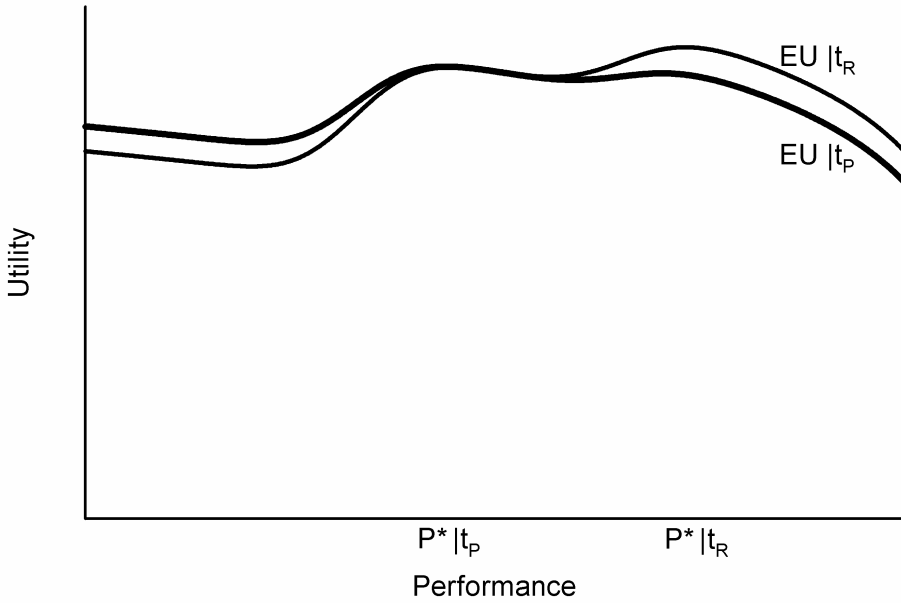


Figure 2.4.
 P^* under t_R and t_P



CHAPTER 3

PERSONAL TAXATION, CORPORATE AGENCY COSTS AND FIRM PERFORMANCE¹

Abstract

This paper investigates the effect of personal-tax progressivity on management performance and agency costs by examining measures of corporate operating efficiency. We study a sample of US-based manufacturing and service firms and variations in across-state tax policy. Using matched-pair testing and regression analysis, we find evidence consistent with the hypothesis that increased personal-tax progressivity negatively impacts management productivity and is manifested in reduced firm efficiency. We control for several other factors that the literature suggests are relevant to firm operating efficiency and find that our results are robust.

JEL Classification: G30, H21, J24

Keywords: corporate governance, agency costs, corporate performance, personal taxes

¹ Co-authored with David A. Stangeland, I.H. Asper School of Business, University of Manitoba, Winnipeg, Canada R3T5V4.

3.1. Introduction

Interest in tax policy has been spurred by recent developments in Eastern Europe, with a particular emphasis on the issue of how the burden of taxes should be distributed among individuals in different income groups. Since 1994, nine Eastern European countries have adopted a flat tax system.² This is in stark contrast to many Western European countries that maintain the more traditional progressive system that has several tax brackets and marginal rates that increase with personal income. Given the long-term trend toward economic integration and capital mobility, how tax policy may affect economic competitiveness is of increasing importance to public policy makers, investors and researchers alike. While economic competitiveness has many dimensions, one potentially important dimension that has received little attention to date is how personal taxes may impact firm efficiency. In this paper, we attempt to answer this question by analyzing the empirical relationship between personal-tax progressivity and firm operating performance.

The use of incentives to help align managers' interests with the interests of shareholders is pervasive both in theory and in practice. These incentives are intended to reduce agency costs and drive firm efficiency. While the relationship between incentive design and firm agency costs has received much attention, what has been largely ignored is how the taxation of incentives may impact agency costs.³ In the financial economics literature, the dominant approach to assessing the impact of tax policy is the global

² The countries that have introduced some form of a flat tax system, along with the year of introduction, are: Estonia (1994), Lithuania (1994), Latvia (1995), Russia (2001), Serbia (2003), Ukraine (2004), Slovakia (2004), Georgia (2005) and Romania (2005) [Based on *The Economist* (April 16, 2005) article titled 'The Case for Flat Taxes'].

³ For example, Holmstrom (1979), Grossman and Hart (1983), Gibbons and Murphy (1992) and Choe (2005) provide prescriptive theories of efficient compensation design. Coughlin and Schmidt (1985), Murphy (1985), Jensen and Murphy (1990) and Hall and Liebman (1998) provide descriptive analyses of compensation structure and its effect on performance. However, these papers do not address taxation.

contracting perspective, which requires that the tax positions of all parties to a contract be considered (Scholes and Wolfson, 1992). Under this framework, it is suggested that contract arrangements be set up in a manner that minimizes the present value of the total costs to all contracting parties. In practice, the analysis often exclusively focuses on tax payments instead of other contracting costs. The tax research dealing with managerial incentives generally analyzes tax effects on compensation design without addressing the potential impacts on managerial behavior. The extraction of private benefits, which may be thought of as an untaxed form of compensation, represents a cost to the shareholders but is not considered in the research. This general approach is illustrated in works of Miller and Scholes (1982), Hite and Long (1982), Abowd and Bognanno (1995), Austin, Gaver and Gaver (1998), Hall and Liebman (2000) and Klassen and Mawani (2000). Katascak (2004) also examines the relationship between tax policy and compensation design, but unlike the other cited papers, his model treats agency costs as endogenous and predicts that an increase in marginal personal-tax rates may diminish managerial effort.

Public and labor economics researchers recognize that there can be a wide range of behavioral responses to personal-tax policy changes, including changes in capital accumulation, labor supply, entrepreneurial activity, tax evasion and labor productivity. This recognition has influenced researchers to place more emphasis on assessing tax policy impacts by examining the response of aggregate economic measures, such as taxable income or gross domestic product, in order to capture the net effect of a variety of behavioral responses. While some of the specific responses, such as labor supply effects, have been studied extensively, there is limited direct research on productivity or worker effort effects. Feldstein (1999) suggests that workers subject to higher marginal rates of

taxation may reduce their taxable income by exerting less effort (accepting less responsibility, avoiding travel, etc.) and by receiving ‘compensation’ in forms that are untaxed (i.e. various types of fringe benefits and perquisites). Although not expressed in the terminology of corporate governance research, it is clear that he is suggesting that personal taxation could impact corporate agency costs. Feldstein’s suggestion that progressivity and high marginal tax rates may negatively impact work effort is consistent with the theoretical analyses of Sandmo (1994) and Andersen and Rasmussen (1999), however little empirical research has been directed at assessing this impact at the employee or firm level. One notable exception is the research of Sillamaa (1999), who examines work effort responses to taxation in an experimental setting and finds that work effort increases when the top marginal tax rate is reduced. To the best of our knowledge, there has been no previously published research that has tested the hypothesized negative productivity effect of tax system progressivity using firm level performance data.

In this paper, we examine whether personal-tax progressivity has an effect on managerial performance as reflected in their firms’ operating efficiency. Progressivity is measured with respect to the total tax burden on individuals at different income levels.⁴ A sample of US-based firms is subjected to matched pair testing and cross-sectional regression analysis to determine if tax progressivity is negatively related to firm performance. The main analytical results, based on both methodologies and three separate measures of performance, indicate a significant negative relationship between tax progressivity and firm performance, which is consistent with the theoretical prediction. We also test the robustness of our results by controlling for other factors

⁴ Progressivity is a measure of tax function slope. A tax system is considered progressive if the effective tax rate increases with income; the greater the rate of increase, the more progressive the tax system is considered.

suggested by the literature to be important to firm performance; we continue to find the significant negative relationship between personal-tax progressivity and performance.

In Section 3.2 of this paper we describe a simple theoretical framework in order to provide the motivation for the paper and to develop the hypothesis for testing. Section 3.3 describes our data set and discusses our firm performance measures and our personal-tax progressivity variable. Also included is a discussion and description of other independent variables that serve as control factors. Section 3.4 presents our empirical tests and discusses the results. Section 3.5 concludes.

3.2. Theoretical Framework: Predicted Effect of Personal-Tax Progressivity on Corporate Agency Costs

A managerial employment contract establishes an agency relationship, since the manager (the agent) is acting on behalf of the firms' owners (the principals) and has been delegated, either explicitly or implicitly, decision-making authority over some set of job-related factors. This decision-making authority gives managers, particularly senior managers and executives, control over firm resources. The agent-made decisions about how firm resources will be utilized affect both the economic performance of the firm and the personal utility that the manager derives from his or her position with the firm. Given that there is some optimal decision set (optimal from the point of view of the principals), deviations from the optimal levels constitute a 'purchase' of non-pecuniary benefits by the agent and results in a net dollar cost to the firm called the residual loss. Principals set up systems of incentives to minimize the overall agency cost, which includes the residual

loss.⁵ The performance incentives include pecuniary rewards such as bonuses and profit sharing and are typically subject to taxation at the personal level, whereas the non-pecuniary benefits associated with employment (i.e. perquisites, on-the-job leisure, power, prestige, etc.) are generally not taxed.⁶

To illustrate the potential impact of personal-tax progressivity, we will consider a very simple model in which a manager undertakes some set of duties for a firm. The manager maximizes utility, which is derived from both taxable pecuniary benefits and non-taxable non-pecuniary benefits (all other factors associated with employment that provide utility). Assume that the manager can perform at a normal level and receive a wage of W or can perform at a high level and receive a wage of W plus a positive bonus of B . The effective personal-tax rate in the normal and high income states are t_N and t_H respectively. High performance results in no utility from non-pecuniary benefits, while normal performance provides a strictly positive amount of utility associated with these non-pecuniary employment related factors. We also assume that after tax compensation is an increasing function of before tax compensation (the marginal personal-tax rate is always less than one) and that the marginal utility of consumption of purchased goods is positive.

The employee will choose to perform at the high level if the utility derived from earning $W + B$ exceeds the utility derived from earning W plus the utility derived from non-pecuniary benefits in the normal performance state. If we assume an additive utility

⁵ This agency framework is similar to that of Jensen and Meckling (1976). The principal minimizes overall agency costs, which includes residual losses, as well as the costs of monitoring and providing incentives to the agent.

⁶ Some employment perquisites are legally subject to personal taxation and others are not (i.e. lavish office arrangements, first class travel, etc.). However, due to problems associated with the observation, measurement and reporting of certain types of perquisites, they are often effectively untaxed, even if they are taxable under the law.

function and denote U_G as the utility derived from the consumption of purchased goods and \bar{U}_A as the utility derived from non-pecuniary benefits in the normal performance state, then the condition necessary for high performance can be stated as follows:

$$U_G((1-t_H)(W+B)) > U_G((1-t_N)(W)) + \bar{U}_A \quad (3.1)$$

If we set t_H equal to $t_N + P$, where P is a measure of personal-tax progressivity, this condition can be stated as:

$$U_G((1-t_N-P)(W+B)) > U_G((1-t_N)(W)) + \bar{U}_A \quad (3.2)$$

The left hand side of (3.2) is a decreasing function of P , while the right hand side is unaffected by P . Therefore, given fixed levels of t_N , W , B and \bar{U}_A , the high performance condition will be satisfied for levels of P below some point P' and will not be satisfied for levels of P above P' . This suggests that progressivity may be negatively related to performance. Alternatively, one can think of P as an exogenous variable and the compensation system component, B , as endogenous. In this case, the principal will adjust the size of the bonus B to ensure that the high performance condition will be met (assuming high performance is worth the cost of the necessary bonus). Here, we would see a positive relationship between B and P . Greater progressivity would necessitate a larger bonus in order to ensure high performance. The bonus is, of course, an agency cost, since it is a cost of aligning the interests of the agent and the principal. Although the principal is still able to elicit high performance, it is achieved at a higher cost to the firm when personal-tax progressivity is increased. In either case, greater progressivity may cause the overall efficiency of the firm to decline. In the former case, where B is not endogenous, lower managerial performance may be utility maximizing and give the result

of lower corporate operating efficiency. In the latter case, with B endogenous, a higher B is required but this results in less corporate productivity net of compensation costs.

It can also easily be seen that the above discussion and conclusions are not dependent on P being a positive value, as would normally be associated with a progressive tax system. The value of P can be positive or negative and the implication of a change in the value of P remains the same. As such, the hypothesized effect of an increase in personal-tax progressivity applies whether the tax system is initially regressive, proportional or progressive.

While our model is a very simplified representation, it does characterize the intuition behind the hypothesis. A pecuniary reward for good performance is less desirable if it is going to be taxed at a higher rate. In response to the higher tax rate, either the reward has to be increased or managerial effort will suffer. In a general equilibrium, with a continuous range of performance possibilities, we would anticipate tax policy changes to result in responses in both managerial effort (as measured by the residual loss) and the incentive system. However, since both responses are reflected in the firm's overall agency cost, we are drawn to the same conclusion that personal-tax progressivity is negatively related to managerial performance, which is manifested in corporate operating efficiency.

Our hypothesis regarding the negative productivity impact of increased tax progressivity is generally consistent with the implications of several models and theories based on a variety of response mechanisms. Sandmo's (1994) promotion competition model predicts that taxation that reduces the after-tax income differential between a promotion and a no-promotion state reduces the aggregate level of effort within a firm.

Feldstein and Wrobel (1998) hypothesize that greater personal-tax progressivity reduces economic efficiency based on the ability of high-skilled labor to relocate to more favorable tax jurisdictions. Katuscak's (2004) agency model predicts that increased taxation of executives weakly diminishes the equilibrium level of managerial effort. Alford's (2005) agency model, which includes imperfect monitoring of productivity and compensation discontinuities, also suggests a negative relationship between personal-tax progressivity and performance.

3.3. Data and Variables

3.3.1. Data

Our sample consists of US-based firms in the manufacturing and service sectors with cross-sections drawn from 1995 and 2002.⁷ There were 1,741 firm observations in 1995 and 1,763 firm observations in 2002. Firm-specific accounting data was obtained from the Compustat database using annual report information. State data regarding taxation was obtained from four sources: (1) the Institute on Taxation & Economic Policy ([ITEP], 1996 and 2003); (2) the National Bureau of Economic Research; (3) the Federation of Tax Administrators⁸ and (4) the Tax Foundation. We use an index developed by Ferris, Lawless and Noronha (2004) as a proxy for the state corporate legal environment. The state data for the appropriate year was then matched to the firms based on the firm's primary location of operation; except for the legal environment measure, which is matched to firms based on the firm's state of incorporation, which often differs

⁷ The sample was limited to these years based on availability of the tax progressivity measure that we used.

⁸ The Federation of Tax Administrators (FTA) corporate tax data for 2002 was accessed on-line. For 1995, corporate tax data was taken from The Council of State Governments (1996), which sourced data from the FTA.

from its physical location. A listing of variables, along with each variable's definition and source, is shown in Table 3.1.

All firms from the Compustat database were included in the sample if they met the following criteria: (1) primary location of operation was in the US; (2) the firm's primary industry was in either the manufacturing or service sector; (3) the firm had more than 25 and fewer than 1000 employees (fewer than 250 for service sector firms); and (4) the firm reported a positive number for its net sales.

This sample construction offered a number of significant advantages. By selecting only US firms, we largely control for a number of factors that may affect firm performance and variable measurement. These factors include federal regulations, the capital market environment, product market competition and the standard used in generating accounting data. By selecting only small firms, it is more likely that operations and personnel are more concentrated in one state and that the majority of management personnel are subject to the same state's tax system. Also, we are better able to control for industry related factors, since smaller firms tend to be less diversified across different industries.

3.3.2. Dependent Variables: Firm Performance

Greater personal-tax progressivity is hypothesized to increase firm agency costs, through higher levels of non-pecuniary benefits and/or through higher costs of providing appropriate performance incentives. This effect should be reflected in various measures of firm operating performance. We use three accounting-based corporate performance

measures because they are able to isolate the specific dimensions of corporate efficiency that we are interested in.

The first measure is the firm's expense ratio (ER), which is the ratio of selling, general and administrative expenses to sales. The ER is intended to capture how well the firm controls expenses, including certain types of perquisite consumption. The second measure is the firm's total asset turnover (TAT), which is the ratio of sales to total assets. The TAT indicates the efficiency with which the firm utilizes its assets. It reflects the performance outcome of past investment decisions, specifically, how productive the firm's assets are in generating sales. The third measure is the operating return on assets (OROA), which is the ratio of earnings before interest, taxes, depreciation and amortization to the total assets. The OROA reflects the overall operating efficiency of the firm.

Holding non-agency factors constant, a higher value for ER and lower values for both TAT and OROA are consistent with management choosing a lower level of effort to maximize their utility – leading to less cost control, less utilization of assets and an overall lower operating return. In addition, if the compensation function (*B* component) is adjusted to compensate for higher personal-tax progressivity then the same results for ER (a higher value) and OROA (a lower value) would be expected. Thus, we can use these variables as indicators of inferior corporate performance that results from higher incentive costs caused by higher personal-tax progressivity.

3.3.3. *Personal-Tax Progressivity Measurement*

In order to test the personal-tax progressivity hypothesis, it is necessary to construct a variable that measures the progressivity of each state's tax system. Since all forms of state and local taxation (income taxes, excise taxes, sales taxes and property taxes) affect the purchased consumption of an agent, we are interested in the combined burden of the overall tax system.⁹ Taking into consideration alternative forms of taxation, other than personal income tax, may be particularly important in this context since personal income tax only accounts for about 22% of the total tax revenue of state and local governments (US Census Bureau 2004). Sales, excise and property taxes are important forms of revenue for state and local governments. The existence and design of these forms of taxation, along with the structure of the personal income tax, together determine how the burden of taxation is distributed among individuals in different income groups.

Personal-tax progressivity can be measured in a variety of ways and the choice of the most suitable index depends, in part, on the purpose for which it is being measured. Since we are attempting to assess how personal taxes affect firm efficiency based on behavioral responses of managers, it is desirable to measure progressivity over a relevant income range. Since all firm managers are delegated some decision making authority and may, therefore, influence firm agency costs, we measure personal-tax progressivity over the upper half of the income distribution.

⁹ It is not only the income tax that affects the agent's purchased consumption. For instance, with a sales tax of s and no income tax, X dollars of income can purchase $X/(G(1+s))$ units of a good with a price of G . This is equivalent to having no sales tax and an effective income tax rate of $t = 1 - (1+s)^{-1}$, since it results in the same purchasing power given X dollars of pre-tax income and a good price of G .

The specific index used in this paper is a measure of the spread in tax rates, similar in form to that used by Feldstein and Wrobel (1998) and Gentry and Hubbard (2000; 2004). We measure personal-tax progressivity in terms of the difference in the tax rate at high and moderate income levels.¹⁰ We define our tax progressivity measure as the effective tax rate on the highest 5% income group minus the effective tax rate on the middle 20% income group. Measuring the tax rates based on distributional positions within the state, as opposed to at specific dollar income levels, takes into account real income variations across states and may therefore be a better measure of state policy regarding the distribution of the tax burden (Chernick 1997). The effective tax rate used in constructing the index is the percentage of income paid (directly or indirectly) for state and local taxes. This is measured net of the federal deductibility of state taxes. Information on the method (i.e. tax incidence assumptions) used to generate the effective tax data can be found in the source documents (ITEP 1996; 2003). Also, both Chernick (1997) and Reschovsky (1998) provide commentary on the ITEP methodology.

A potential problem with this measure of personal-tax progressivity is that it is not strictly predetermined, since behavioral responses to the tax system can affect the income distribution, which in turn influences the progressivity measure.¹¹ In order to deal with this potential endogeneity problem, we also perform two-stage least squares regressions in which we instrument for our progressivity measure. The instrumental

¹⁰ This is conceptually similar to Gentry and Hubbard (2004). They use the difference in the marginal tax rate in an average successful state (finding a new job that pays more) and a benchmark state (the worker's current income level). We use the difference in the effective tax rate between a successful state (earning greater rewards through promotion, bonuses, etc.) and a benchmark state (income at a moderate level of productivity). In both cases, the progressivity index is a measure of the tax function average slope over some income range.

¹¹ We wish to use the tax parameter to explain agent behavior, however agent behavior may influence our tax parameter since it is based on both the statutory tax rates and the income distribution (income distribution may be influenced by responses to the tax system).

variable is the top marginal personal income tax rate (total of state and federal income taxes) net of deductibility of state income tax on the federal return and federal income tax on the state return.¹² This variable has a high correlation with our progressivity measure and, since it depends only on variation in state tax laws and not, at least in any obvious way, on individual or firm responses to the tax system, it is considered exogenous.

3.3.4. Control Variables

While we are interested in the potential effect of tax structure on firm performance, we must also control for other potentially important determinants of firm performance. The performance variables that we use are frequently found in financial economics and accounting research and we rely on the same control variables typically found in this research. First, it has long been thought that characteristics of the firm's financial structure can influence its performance (Berle and Means 1932). Firm creditors provide monitoring of management behavior and the influence of creditors would increase as leverage increases. Also, high leverage requires operating cash flows to meet debt obligations and places the firm at risk of insolvency, which may increase managerial performance incentives (Jensen 1986). Leverage is measured as the ratio of total liabilities to total assets.¹³

Firm size may affect our performance variables for a variety of reasons, including potential economies of scale. Size is measured as the natural logarithm of firm net sales.

¹² The data is based on a taxpayer with a wage income of \$250,000 who is married and is filing jointly. The data series is from the National Bureau of Economic Research TAXSIM model and information on the model and this data series are available from Feenberg and Coutts (1993) and the NBER website (www.nber.org/~taxsim).

¹³ Another aspect of the ownership structure that is a possible determinant of performance is the equity distribution. Holderness (2003) provides a recent survey of the research and, based on the mixed evidence cited, he concludes that equity ownership characteristics appear to have little impact. Nonetheless, the omission of equity related control variables is further discussed in Subsection 3.4.6.

The relative amount that a firm invests in fixed capital may affect firm agency costs, since tangible assets are more easily monitored by outsiders than certain non-tangible assets. Furthermore, the relative investment in fixed assets is indicative of the firm's technology and may reflect a specific management strategy or reaction to local input cost conditions. We measure the relative investment in fixed capital using the fixed asset ratio, which is fixed assets divided by total assets. The squared values of the leverage, size and fixed asset ratio variables are also incorporated into the regression models to allow for nonlinearities in their relationships to performance. Two further firm-specific control variables are also incorporated into the analysis. The firm's sales growth is included, since it may be indicative of the firm's product lifecycle stage, and the firm's industry is included as a control for obvious reasons.

In addition to the firm-specific variables, there may be factors in the firm's operating environment, in addition to tax progressivity, that affect its performance. It should be noted that intranational variation in environmental factors is rarely considered in models explaining the accounting-based measures of performance used in this paper. Despite limited guidance in the literature, we attempt to identify the most relevant potential influences.

State and local government program spending is controlled for by incorporating a variable that measures the average tax burden. This variable is defined as the total state and local tax burden as a percentage of total income in the state. The state corporate income tax rate is also a potentially significant factor influencing firm performance, for which we control.¹⁴ Finally, as noted by Cary (1974), the corporate legal environment

¹⁴ We also tried including controls for the state's per capita income (based on U.S. Department of Commerce data (2003)) and a variable measuring the effective overall tax rate on the highest five percent

varies within the US and affects investors' rights and potentially influences managerial behavior. Since corporate legal jurisdiction depends on the state of incorporation and not on the physical business location, we include in the analysis a state-dependent legal environment measure (LEM) based on the firm's state of incorporation. The LEM index that we used was developed by Ferris, Lawless and Noronha (2004). This index reflects both the presence/absence of key corporate law statutes (i.e. various antitakeover statutes) and, if adopted, how quick a state was to adopt it, relative to other states. Unlike other corporate law indices, this index reflects both the existing statutory law of the state, as well as its legal orientation (how quick it is to adopt new types of antitakeover statutes). A higher LEM index indicates the presence and more rapid adoption of laws that entrench existing management.¹⁵ Summary statistics for the dependent and independent variables are provided in Table 3.2.

3.4. Empirical Analysis: Matched Pair Testing and Regression Analysis

3.4.1. Matched Pair Testing

Our initial examination of the potential impact of tax progressivity utilizes a matched pair testing technique. The advantage of this procedure is that it concentrates the analysis on those firms facing the most extreme tax environments, which may help

income group (based on ITEP data (1996; 2003)). The former was insignificant in most regression specifications. The latter was not consistently significant and it contributed to multicollinearity problems. Although not reported, the inclusion of these variables does not significantly change the results or conclusions with respect to our progressivity measure.

¹⁵ As a robustness check, an alternative legal environment control variable (a dummy variable for incorporation in Delaware) was also tested in the regressions (as per Daines (2001)). Approximately 58% of our sample firms are legally incorporated in Delaware (although only a very small number are physically located there). This alternative control procedure, which is referred to as the "Traditional Model" in Chapter 4, leads to the same conclusions with respect to our progressivity measure. More complex corporate law control procedures, such as that of Models 1, 2 and 3 used in Chapter 4, were not utilized here, in part, due to the smaller sample employed in the Chapter 3 research.

overcome limited variation in our progressivity variable. The data set for the matched pair testing consists of a 1995 sample of 1,741 firms and a 2002 sample of 1,763 firms. Each sample is organized into quintiles based on the personal-tax progressivity measure. Firms in the highest progressivity quintile are matched to firms in the lowest progressivity quintile based on both industry (four digit primary SIC match) and firm size.¹⁶ If no match based on these criteria is possible, the firms are excluded from testing. The performance of the matched firms is then compared in an attempt to determine if there are systematic differences based on the tax environment in which the firm operates. A data series of performance differences is created by subtracting the value of the low quintile firm performance parameter from the value of the performance parameter of the matched high quintile firm. This is done for all three of our performance measures (ER, TAT and OROA) in both cross-sections.

Two types of tests on the matched firms' performance differences are conducted for all three measures of firm performance. The first test is a simple matched pair t-test. The mean value and standard error of the mean for each performance difference data series is calculated. This is used to calculate a t-statistic; a p-value is reported based on the null hypothesis of zero mean difference with a two-sided alternative hypothesis.¹⁷ Since this first test assumes a normal distribution of the performance difference data series, which may not hold, we also perform a second non-parametric test.

¹⁶ The natural logarithm of the high quintile firm's sales divided by the low quintile firm's sales had to be less than 0.405 in absolute value. This meant that the smaller firm's sales were at least 67% of the larger firm's sales.

¹⁷ Statistical tests based on two sided alternative hypotheses are used because they are the standard in this type of literature. In actuality, given our one-sided hypothesis, our reported p-values may be divided by two to reflect one-sided tests.

The second test is the Wilcoxon signed rank test, which utilizes the same three data series (difference in performance between the high quintile firm and its matched low quintile firm). It, however, tests the hypothesis that the median difference is zero and it makes no assumption regarding the form of the distribution. Again, a p-value based on a two-sided alternative hypothesis is reported.

Our model suggests that the firms located in a state with a higher level of tax progressivity should have inferior performance to a matched firm that operates in a state with a lower level of tax progressivity. As such, we would expect a positive mean and positive median difference for ER and a negative mean and negative median difference for both TAT and OROA.

3.4.2. Matched Pair Test Results

The matched pair test results are presented in Table 3.3. From our high and low progressivity quintiles, we were able to create 129 firm matches in our 1995 sample and 157 firm matches in our 2002 sample. The average difference in the personal-tax progressivity index faced by high and low quintile matched firms was 3.14 in 1995 and 3.03 in 2002.

As shown in Panel A, the average performance of firms located in states with high personal-tax progressivity was inferior to that of the matched firms located in low progressivity states. This average performance difference was consistent across all three performance measures in both the 1995 and 2002 samples. We observe a positive mean difference for ER and a negative mean difference for both TAT and OROA. The performance differences are economically significant and consistent with the

hypothesized impact of personal-tax progressivity. If we assume that the firm performance differences are normally distributed, the results associated with ER are statistically significant at the 1% level for both samples; the results for OROA are statistically significant at the 1% level for 1995 and the 5% level for 2002; the result for TAT is significant at the 10% level for 1995. Only the 2002 test associated with TAT was statistically insignificant (although it is significant at the 10% level given the more appropriate one-sided test).

The non-parametric test results are presented in Panel B. The median difference for all three performance measures in both years is consistent with the hypothesis. In addition, for both sample years the Wilcoxon sum of ranks is greater for positive observations (positive observations of the performance difference) for ER and greater for negative observations for both TAT and OROA. This is also consistent with the hypothesis. The Wilcoxon test indicates statistically significant results for all three performance measures for both years. All results are significant at the 5% level, with three of the six results significant at the 1% level.

Overall, the evidence from the matched pair testing is consistent in sign with the tax progressivity hypothesis and is statistically significant. Next, we investigate the robustness of our results by conducting regression analysis that includes additional control variables.

3.4.3. Regression Testing

The cross-sectional data is pooled and analyzed with both ordinary least squares and two-stage least squares regressions.¹⁸ While this methodology has certain drawbacks in terms of addressing potential omitted variables bias, it also has advantages in this context. First, even if we had annual data on the progressivity variable, it would tend to be stable, changing little from one year to the next. With low levels of temporal variation ('within subject variation') in the independent variable of interest, fixed effects estimation using panel data may not detect a relationship even if one exists (Zhou 2001). Second, we may expect that the relationship between annual changes in the tax system and annual changes in firm performance would be weak since the effect of altered managerial behavior may not be reflected immediately in the accounting-based performance measures. This leads us to believe that there could be a relationship between the levels of the variables, even if there is no apparent relationship in the annual changes. As such, we depend on pooled cross-sectional variation to determine if there is a potential relationship between personal-tax progressivity and firm performance.

In setting up our regression models for testing it was recognized that two of our three performance variables, ER and TAT, have skewed distributions and are, by construction, non-negative. Each is transformed by taking its natural logarithm.¹⁹ The transformed variables are denoted LER and LTAT respectively. In using a semi-log model (log-linear) to explain these two performance measures, we assume that unit

¹⁸ Separate regressions on unpooled data were also run, testing each year's cross-section independently, with similar results (not shown).

¹⁹ Regressions using the untransformed variables (ER and TAT) resulted in residuals that were highly skewed. Regressions using the transformed variables (LER and LTAT) resulted in residuals with distributions that more closely corresponded to a normal distribution. In addition, the log transformation makes the model less sensitive to the effect of extreme outlier observations (Wooldridge 2003). A log transformation of OROA is not possible due to the occurrence of negative observations for this variable.

changes in our independent variables result in a constant percentage change effect on the ER and TAT variables. The hypothesized coefficient on our progressivity measure remains unchanged as a result of this specification.

The tax progressivity measure and all of the control variables discussed in Subsection 3.3.4 are included in the regressions. As previously noted, the 2SLS regressions treat progressivity as endogenous and utilize an additional variable as an instrument, which is the statutory top marginal personal income tax rate in the state. Separate intercepts for each year are included and fixed industry effects are based on the firm's 2-digit primary SIC.

3.4.4. Regression Test Results

The regression results are presented in Table 3.4. The regressions examine the effect of personal-tax progressivity on the firm performance variables: LER, LTAT and OROA. The sign of the slope coefficient on progressivity is consistent with our theoretical expectation in all six regressions. Our hypothesis suggests that higher personal-tax progressivity should be associated with decreased performance (higher ER, lower TAT and lower OROA).

Based on OLS estimation, the slope coefficient on progressivity is statistically significant at the 1% level for all three performance measures. In the 2SLS regressions, the slope coefficient on progressivity is statistically significant at the 5% level for both LER and OROA, but is not significant for LTAT (p -value is 0.16). Consistent with the matched-pair testing, the overall regression results are generally supportive of the hypothesized negative impact of progressivity on firm performance.

Several of the control variables were statistically significant in a number of the model specifications. These generally significant control variables included the size, leverage, fixed asset ratio and LEM variables, the latter three of which were not utilized in the matching procedure for the matched-pair testing. This indicates an advantage of the regression testing procedure over the matched-pair testing. The coefficients on the size and size-squared variables indicate non-linear economies of scale. The coefficient on the LEM variable, in the various specifications, indicates that a legal environment that entrenches management tends to lead to inferior firm performance; this corporate law issue is explored in Chapter 4.

It was noted that our sample consists of a significant number of firms in financial distress; approximately 8% of the firms in the sample had a leverage variable of one or more. Since the situation of these firms is not representative of normal operating conditions and may significantly impact the coefficient estimates, we repeated the regressions with these firms excluded from the analysis. Similar results were found. In addition, there were five observations in the sample associated with firms that reported no fixed assets. The elimination of these firms from the sample also has no impact on the regression results (or the matched-pair testing results).

3.4.5. Sensitivity Analysis: Omitted Variables Bias

As with most empirical research, a significant area of concern is that our testing techniques could be subject to bias induced by the omission of significant control variables. In the case of the matched pair testing, the high and low quintile firms may systematically differ in terms of some other factor, apart from tax progressivity, and this

other factor may actually be driving the apparent performance differences. In order to partially address this concern, the matched firms from the progressivity tests are compared in terms of ten other variables. These include: sales growth; two measures of firm leverage (ratio of liabilities to total assets and ratio of total long term debt to total assets); two measures of relative dependence on fixed assets (ratio of fixed assets to total assets and ratio of fixed assets to employees); firm size²⁰; the relative income level in the firm's home state; and three tax variables of the firm's home state (average tax burden, the corporate tax rate and the effective tax rate on the highest 5% income group). For six of the ten variables there is no evidence of a systematic difference in the characteristics of the high and low quintile firms. The differences for several of the variables are both economically and statistically insignificant for at least one of the two years. Also, several variables have positive differences in one year and negative differences in the other. As such, there is no evidence to suggest that the performance difference between our high and low progressivity firms should be attributed to any of these six other factors that were not controlled for in the matching process.

For the four other variables (fixed asset to total asset ratio and the three tax related variables) there is some evidence of systematic differences between the high and low progressivity firms. To assess the potential effect of failing to control for these four factors, we regress the performance differences on the differences in each of the four variables. We find that these four factors appear to have little explanatory power with respect our performance differences. The F-statistic is insignificant and the adjusted R-squared is less than 2% for five of the six regressions (there are six regressions based on

²⁰ Although size, as measured by firm sales, was controlled for in the matching procedure, it was checked anyway to ensure that good size matching had been achieved.

two sample years and three different performance measures). As such, we conclude that there is no substantive evidence that our matched pair test results are driven by these omitted control factors.

Our regression testing utilizes variables not included in our firm matching procedure and, as such, is less susceptible to omitted variables bias. As previously noted in Subsection 3.3.4, a number of additional control variables, not reported in our main results, are tested in alternative regression specifications to help guard against this potential problem. Furthermore, it is expected that the omission of certain potential control variables may actually bias against the identification of a tax progressivity effect. We do not, for instance, control for characteristics of the firm equity structure, such as ownership concentration or structure. However, ownership concentration and structure may respond to exogenous environmental factors that affect firm agency costs (La Porta, Lopez-de-Silanes, Shleifer and Vishny 1998). If we assume that an increase in personal tax progressivity would tend to drive up agency costs and lower firm operating performance, we should expect that the equilibrium level of ownership concentration (and other agency cost control mechanisms) would adjust to partially offset the negative effect of increased tax progressivity. As such, the effect of a change in progressivity may be obscured by the reaction of agency cost control mechanisms for which we have incomplete controls.

Another omitted variables issue stems from the nature of our data set. The number of firm observations from each state in our sample is not the same; the larger states contribute far more observations to the sample. This increases the risk of an endogeneity problem, as progressivity differences are more likely to be correlated with

omitted state-related variables under these circumstances. As such, our results may be sensitive to omitted state effects.

This is particularly problematic in the matched-pair testing because California has the highest firm representation and is also one of the most progressive tax states. As a result, our high progressivity quintile of firms consists almost entirely of California firms in both years. The state representation is much broader in the low progressivity quintile and changes significantly from 1995 to 2002. Since our high progressivity group of firms consisted almost exclusively of California firms in both years, the observed performance differences in the matched firms could be driven by some other factor unique to California. Unfortunately, there is no conclusive way to test this. If we remove the California firms we decrease both the variation in progressivity across our matched firms (which is already low) and we also significantly reduce the sample size. Lack of significance and a lack of statistical power of the test are the end result.

To assess the potential bias in our regression results, we consider performing fixed state effects regressions using a partial set of state dummy variables.²¹ Unfortunately, such regressions are subject to severe multicollinearity, which makes the regression coefficients and significance levels unreliable. Although there is no consensus on when multicollinearity is excessive, there are a number of guidelines suggested in the econometrics literature. Belsley, Kuh and Welsch (1980) suggest that a condition number in excess of 20 is suggestive of a potentially serious problem; the condition number associated with the explanatory variable matrix for our fixed state effects regression is 73. Another guideline, suggested by Klein (1962), indicates that if

²¹ A state dummy variable is assigned for each state contributing 5% or more of the firm observations.

$R_k^2 > R^2$, then the multicollinearity is severe.²² $R_{progressivity}^2$ is 0.71, which is well in excess of the coefficient of determination in each of the fixed state effects regressions. Finally, the variance inflation factor (VIF) with respect to the progressivity coefficient is 3.5. Allison (1999) suggests that a VIF exceeding 2.5 is problematic.

Recognizing that the fixed state effects model is subject to a severe multicollinearity problem indicates that, given our sample limitations, it is difficult to disentangle progressivity differences and state effects. In our sample, much of the variation in the progressivity measure is contributed by the firm observations from a small number of states, particularly California (a high progressivity state contributing the largest number of observations). Removing California firms from the sample reduces the standard deviation of the progressivity measure by 24% and reduces the sample size by 26%. Hence removing California firms from the sample may leave too little variation to detect progressivity effects, while specifically trying to control for omitted California (and other states') effects leads to high multicollinearity.

3.4.6. Sensitivity Analysis: Alternative Measure of Personal-Tax Progressivity

As noted in Subsection 3.3.3, the analysis in this paper relies on a measure of personal-tax progressivity that is based on the combined burden of all types of state and local taxes. The justification for this approach is that all forms of taxation, not just income tax, affect the amount of consumption an agent can purchase with the compensation that he or she earns. However, it may be argued that the indirect taxation

²² R_k^2 is the coefficient of determination from a regression of explanatory variable k on the other explanatory variables in the original regression model. R^2 is the coefficient of determination of the original regression model.

of income, through excise, sales and property taxes, may not substantially impact work behavior since individuals have discretion in when and to what extent these taxes will be incurred. As such, the only tax that may impact agent (manager) behavior may be the personal income tax. To determine whether our main results are sensitive to how personal-tax progressivity is measured, we construct an alternative measure of progressivity that is based exclusively on the burden associated with personal income taxes.

Our alternative personal-tax progressivity measure is similar in form to our main progressivity measure in that it is a measure of the spread in tax rates between different income groups. It is calculated as the effective personal income tax rate on the highest 5% income group minus the effective personal income tax rate on the middle 20% income group. The effective tax rate used in constructing this alternative index is the percentage of income paid for state and local personal income taxes and is based, once again, on ITEP (1996; 2003) data.

A direct comparison of our two progressivity measures indicates that they are highly correlated; the correlation coefficient is 0.80. This high correlation can be partly attributed to the fact that our main progressivity measure takes into account personal income taxes, which is the only type of tax considered by our alternative measure. In addition, there appears to be a relationship between the levels of utilization of different types of taxes that contributes to the high correlation.²³

We repeated the regression tests described in Subsections 3.4.3 and 3.4.4, using the alternative measure of personal-tax progressivity. The results, which are presented in

²³ States that raise substantial revenue through personal income taxes (income taxes are usually progressive) tend to rely less heavily on other types of taxes (excise, sales and property taxes are usually regressive).

Table 3.5, are very similar to those obtained using our original progressivity measure. In all six regressions, the sign of the slope coefficient on the alternative progressivity measure is consistent with our theoretical expectation that higher personal-tax progressivity is associated with increased agency costs and decreased firm performance. In the OLS regressions, the results are statistically significant at the 1% level for all three performance measures. In the 2SLS regressions, the results are significant at the 5% level for two of our three performance measures. Furthermore, the use of the alternative progressivity measure does not substantially alter the model fit based on the adjusted *R*-squared statistic. As such, we would conclude that our results are not sensitive to the choice of progressivity measure; examining the combined effect of all forms of taxes or the effect of income taxes only yields nearly identical results.

3.5. Conclusions

Most firms reward performance, either explicitly or implicitly, with greater taxable compensation to managers. If, however, greater compensation is subject to higher taxation, we would expect that the effectiveness of the reward will be diminished or that the firm will have to increase the size of the pretax reward.²⁴ This expectation is straightforward and intuitive but rarely discussed in the finance literature that analyzes firm performance or agency costs. In addition, there are many difficulties in attempting to empirically assess this expectation. The performance characteristics of an international sample of firms would be affected by a multitude of differential factors and is fraught with various measurement problems. A US sample, such as we have used, helps limit the

²⁴ Similarly, if greater compensation is subject to lower taxation, we would expect that the effectiveness of the reward to be enhanced, leading to either greater productivity or a lower firm cost to provide appropriate incentives.

number of control factors, but greatly limits the degree of tax-system variation in the sample. Despite the inherent analytical difficulties, the effect of personal-tax progressivity on firm performance is an important empirical issue to attempt to characterize.

To summarize our analytical findings, we have found evidence consistent with the hypothesized negative impact of personal-tax progressivity on managerial performance and firm efficiency. Our results are robust to various control variables suggested by the literature and hold under both a matched pair analysis and a regression analysis. The personal-tax progressivity hypothesis, if true, has significant public policy implications since tax progressivity would then impact a jurisdiction's economic efficiency and may affect capital investment levels. In addition, the personal-tax progressivity hypothesis has potentially important methodological implications for other research into firm efficiency and agency costs. If a jurisdiction's personal-tax policy is a significant determinant of performance, then characteristics of the tax system, such as personal-tax progressivity, should be controlled for in cross-jurisdictional (particularly cross-country) studies of firm performance.

References

- Abowd, J., Bognanno, M., 1995. International differences in executive and managerial compensation. In: Freeman, R., Katz, L. (Eds), *Differences and Changes in Wage Structures*. The University of Chicago Press, Chicago, 67-103.
- Alford, S.C., 2005. Tax policy and managerial performance: an agency perspective with performance thresholds. University of Manitoba Working Paper, September 2005.
- Allison, P.D., 1999. *Multiple Regression: A Primer*. Pine Forge Press, Thousand Oaks, CA.
- Andersen, T.M., Rasmussen, B.S., 1999. Effort, taxation and unemployment. *Economics Letters*, 62, 97-103.
- Austin, J., Gaver, J., Gaver, K., 1998. The choice of incentive stock options vs. nonqualified options: a marginal tax rate perspective. *Journal of the American Taxation Association* 20, 1-21.
- Belsey, D.A., Kuh, E., Welsch, R.E., 1980. *Regression Diagnostics*. John Wiley and Sons, New York.
- Berle, A.A., Means, G.C., 1932. *The Modern Corporation and Private Property*. Macmillan, New York.
- Cary, W.L., 1974. Federalism and corporate law: reflections upon Delaware. *Yale Law Journal* 88, 663-707.
- Chernick, H., 1997. Tax progressivity and state economic performance. *Economic Development Quarterly* 11, 249-267.
- Choe, C., 2005. Optimal CEO compensation: some equivalence results. *Journal of Labor Economics*, Forthcoming.
- Coughlan, A., Schmidt, R., 1985. Executive compensation, management turnover, and firm performance: an empirical investigation. *Journal of Accounting and Economics* 71, 43-66.
- Council of State Governments (CSG), 1996. *The Book of States 1996-97 Edition*. CSG: Lexington, Kentucky.
- Daines, R., 2001. Does Delaware law improve firm value? *Journal of Financial Economics* 62, 525-558.
- Federation of Tax Administrators, 2002. Range of state corporate income tax rates. http://www.taxadmin.org/fta/rate/tax_stru.html (accessed Nov 2002).

- Feenberg, D., Coutts, E., 1993. An introduction to the TAXSIM model. *Journal of Policy Analysis and Management* 12, 189-194.
- Feldstein, M.S., 1999. Tax avoidance and the deadweight loss of the income tax. *The Review of Economics and Statistics* 81 (4), 674-680.
- Feldstein, M.S., Wrobel, M.V., 1998. Can state taxes redistribute income? *Journal of Public Economics* 68, 469-396.
- Ferris, S.P., Lawless, R.M., Noronha, G., 2004. The influence of state legal environments on firm incorporation decisions and values. CORI Working Paper No. 2004-13, Oct 2004.
- Gentry, W.M., Hubbard, G.R., 2000. Tax policy and entrepreneurial entry. *American Economic Review* 90, 283-287.
- Gentry, W.M., Hubbard, R.G., 2004. The effects of progressive income taxation on job turnover. *Journal of Public Economics* 88, 2301-2322.
- Gibbons, R., Murphy, K., 1992. Optimal incentive contracts in the presence of career concerns: theory and evidence. *Journal of Political Economy* 100, 468-505.
- Grossman, S., Hart, O., 1983. An analysis of the principal-agent problem. *Econometrica* 51, 7-45.
- Hall, B., Leibman, J., 1998. Are CEOs really paid like bureaucrats? *Quarterly Journal of Economics* 1133, 653-691.
- Hall, B., Liebman, J., 2000. The taxation of executive compensation. *Tax Policy and the Economy* 14, 1-44.
- Hite, G.L., Long, M.S., 1982. Taxes and executive stock options. *Journal of Accounting and Economics* 4, 3-14.
- Holderness, C.G., 2003. A survey of blockholders and corporate control. *Economic Policy Review* 9 (1), 51-63.
- Holmstrom, B., 1979. Moral hazard and observability. *Bell Journal of Economics* 10, 74-91.
- Institute on Taxation & Economic Policy (ITEP), 1996. Who pays? A distributional analysis of the tax systems in all 50 states. ITEP, Washington, DC.
- Institute on Taxation & Economic Policy (ITEP), 2003. Who pays? A distributional analysis of the tax systems in all 50 states: second edition. ITEP, Washington, DC.

- Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76, 323-329.
- Jensen, M.C., Meckling, W., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360.
- Jensen, M.C., Murphy, K .J., 1990. Performance pay and top management incentives. *Journal of Political Economy* 98, 225–264.
- Katuscak, P., 2004. The impact of personal income taxation on executive compensation. Working Paper, University of Michigan.
- Klassen, K.J., Mawani, A., 2000. The impact of financial and tax reporting incentives on option grants to Canadian CEOs. *Contemporary Accounting Research* 17, 227-262.
- Klein, L.R., 1962. *An Introduction to Econometrics*. Prentice-Hall, Englewood Cliffs, New Jersey.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. *Journal of Political Economy* 106, 1113-1155.
- Miller, M.H., Scholes, M.S., 1982. Executive compensation, taxes, and incentives. In: Sharpe, W.F., Cootner, C.M. (Eds.), *Financial Economics: Essays in Honor of Paul Cootner*. Prentice-Hall, Englewood Cliffs, New Jersey, 179-201.
- Murphy, K., 1985. Corporate performance and managerial remuneration: an empirical analysis. *Journal of Accounting and Economics* 7, 11-41.
- National Bureau of Economic Research, 2004. Maximum state income tax rate 1977-2002. <http://www.nber.org/~taxsim/state-rates/> (accessed Feb 2004).
- Reschovsky, A., 1998. The progressivity of state tax systems. In: Brunori, D. (Ed.), *The Future of State Taxation*. The Urban Institute Press, Washington, DC.
- Sandmo, A., 1994. The tax they pay may be your own: promotion, taxes and labour supply. *Scandinavian Journal of Economics* 96, 463-479.
- Scholes, M.S., Wolfson, M.A., 1992, *Taxes and Business Strategy: A Planning Approach*, Prentice Hall, Englewood Cliffs, New Jersey.
- Sillamaa, M.A., 1999. How work effort responds to wage taxation: an experimental test of a zero top marginal tax rate. *Journal of Public Economics* 73, 125-134.
- Tax Foundation, 2005. 50-state comparison of state and local tax burdens: 1970-2005. <http://www.taxfoundation.org/statelocal.html> (accessed Apr 2005).

- U.S. Census Bureau, 2004. State and local government finances by level of government and by state 2001-02. <http://www.census.gov/govs/www/estimate02.html> (accessed March 2005).
- U.S. Department of Commerce, Bureau of Economic Analysis, 2003. Annual state per capita personal income. <http://www.bea.doc.gov/bea/regional/spi/> (accessed Feb 2003).
- Wooldridge, J.M., 2003. *Introductory Econometrics: A Modern Approach*. 2nd Edition, South-Western, Mason, Ohio.
- Zhou, X., 2001. Understanding the determinants of managerial ownership and the link between ownership and performance: comment. *Journal of Financial Economics* 62, 559-571.

Table 3.1.
Variables information

Variable	Definition	Source
ER	The firm's expense ratio calculated as selling, general and administrative expenses divided by net sales.	Compustat
LER	Natural logarithm of ER.	
TAT	The firm's total asset turnover calculated as net sales divided by total assets.	Compustat
LTAT	Natural logarithm of TAT.	
OROA	The firms operating return on assets, calculated as the earnings before interest, taxes, depreciation and amortization divided by the firm's assets.	Compustat
Progressivity	Progressivity measure, which is the effective tax on the highest 5% income group minus the effective tax on the middle 20% income group in the state in which the firm operates.	ITEP 1996 & 2003
Alternative progressivity measure	An alternative progressivity measure, which is the effective personal income tax on the highest 5% income group minus the effective personal income tax on the middle 20% income group in the state in which the firm operates.	ITEP 1996 & 2003
Top marginal income tax rate	The maximum marginal personal income tax rate (combined state and federal income taxes) in the state in which the firm operates.	National Bureau of Economic Research
Leverage	Leverage as measured by the firm's ratio of total liabilities to total assets.	Compustat
Size	Size as measured by the natural logarithm of firm net sales.	Compustat
Fixed asset ratio	Fixed asset to total asset ratio as measured by the firm's net property, plant and equipment divided by the firm's total assets.	Compustat
Sales growth	Sales growth percentage, which is the annualized 3 year sales growth percentage based on sales data from annual reports.	Compustat
Average tax	Average tax, which is the total state and local tax burden as a percentage of total state income in the state in which the firm operates.	Tax Foundation
Corporate tax	Corporate tax, which is the state corporate income tax rate (or equivalent tax on corporate income) in the state in which the firms operates. Calculated net of federal tax deductibility if applicable. Where tax rate is not flat, the top marginal rate was used.	Federation of Tax Administrators
LEM	Legal Environment Measure, which is an index describing the corporate legal environment of the state where the firm is incorporated.	Ferris, Lawless and Noronha (2004).
Industry dummy	Industry effects used in the regressions were based on the primary standard industrial classification (SIC) code of the firm.	Compustat

Table 3.2.
Summary statistics for variables

Variable	Mean	Median	Standard deviation	Minimum	Maximum
ER	0.932	0.370	5.966	0.010	213.962
TAT	1.166	1.056	0.888	0.000	13.932
OROA	-0.087	0.047	0.699	-29.060	1.162
Progressivity (%)	-2.854	-2.800	1.210	-6.320	-0.560
Alt. progressivity measure (%)	2.024	1.740	1.664	-0.380	4.380
Top marg. inc. tax rate (%)	41.920	42.320	2.419	36.680	44.920
Leverage	0.545	0.400	0.873	0.016	25.820
Sales (millions \$)	53.114	25.125	96.718	0.004	2744.191
Fixed asset ratio	0.199	0.141	0.176	0.000	0.937
Sales growth (%)	52.978	10.045	763.6	-91.4	41970.
Average tax (%)	10.142	10.100	1.051	6.900	13.000
Corporate tax (%)	7.648	8.840	2.335	0.000	10.750
LEM	15.137	16.660	4.009	5.780	27.770

Summary statistics are based on the full sample. ER stands for expense ratio. TAT stands for total asset turnover. OROA stands for operating return on assets. Leverage is measured as the ratio of firm liabilities to firm total assets. Fixed asset ratio is the ratio of firm fixed assets to firm total assets. LEM stands for legal environment measure (an index of corporate law). Variable definitions and data sources are provided in Table 3.1.

Table 3.3.
Matched pair testing: comparison of firms in most progressive tax environment and matched firms in least progressive tax environment

<u>Panel A</u> : Parametric Test of Performance Difference				
	Progressivity	ER	TAT	OROA
Matches from 1995 sample (129 matches):				
Matches with parameter data for both firms	129	105	118	128
Hypothesized difference	-	positive	negative	negative
Mean difference	3.143	0.227	-0.152	-0.162
<i>p</i> -value	-	.0013	.0502	.0005
Matches from 2002 sample (157 matches):				
Matches with parameter data for both firms	157	113	155	155
Hypothesized difference	-	positive	negative	negative
Mean difference	3.030	.272	-0.118	-0.087
<i>p</i> -value	-	.0001	.1237	.0459
<u>Panel B</u> : Non-Parametric Test of Performance Difference				
	Progressivity	ER	TAT	OROA
Matches from 1995 sample (129 matches):				
Matches with parameter data for both firms	129	105	118	128
Hypothesized difference	-	positive	negative	negative
Median difference	2.980	0.079	-0.112	-0.062
# of observations > 0 (mean rank)	-	66 (60.41)	47 (54.88)	43 (60.06)
# of observations < 0 (mean rank)	-	39 (40.46)	69 (60.96)	85 (66.75)
Wilcoxon signed rank z-statistic	-	3.849	2.240	3.674
<i>p</i> -value	-	.0001	.0251	.0002
Matches from 2002 sample (157 matches):				
Matches with parameter data for both firms	157	113	155	155
Hypothesized difference	-	positive	negative	negative
Median difference	2.440	0.157	-0.090	-0.074
# of observations > 0 (mean rank)	-	75 (63.03)	58 (76.23)	66 (73.16)
# of observations < 0 (mean rank)	-	38 (45.11)	93 (75.85)	89 (81.59)
Wilcoxon signed rank z-statistic	-	4.314	2.445	2.172
<i>p</i> -value	-	.0000	.0145	.0298

Firms were assigned to quintiles based on the progressivity measure. Firms in the highest and lowest quintiles were matched based on industry (same four digit primary SIC) and size (similar level of sales). Firms that could not be matched were excluded from testing. Differences are calculated as the high quintile firm performance parameter minus the performance parameter of its matched low quintile firm. In Panel A, the *p*-values are based on a standard *t*-test of the null hypothesis of zero mean difference (two-sided). In Panel B, the *p*-values are based on a normal approximation to the Wilcoxon signed rank test of the null hypothesis of zero median difference (two-sided with correction for both continuity and ties). The firm performance parameters are the expense ratio (ER), the total asset turnover (TAT) and the operating return on assets (OROA). Variable definitions and data sources are provided in Table 3.1.

Table 3.4.
Regressions of firm performance on personal-tax progressivity and control variables

Independent variable	Dependent variable (and estimation method)					
	LER (OLS)	LER (2SLS)	LTAT (OLS)	LTAT (2SLS)	OROA (OLS)	OROA (2SLS)
Progressivity	0.067*** (0.012)	0.032** (0.016)	-0.050*** (0.013)	-0.023 (0.016)	-0.023*** (0.008)	-0.024** (0.011)
Leverage	-0.115*** (0.026)	-0.117*** (0.027)	0.439*** (0.040)	0.440*** (0.040)	0.066 (0.092)	0.066 (0.092)
Leverage squared	0.006*** (0.002)	0.006*** (0.002)	-0.016*** (0.003)	-0.016*** (0.003)	-0.037*** (0.008)	-0.037*** (0.008)
Size	-2.627*** (0.228)	-2.631*** (0.229)	3.477*** (0.162)	3.481*** (0.161)	0.757*** (0.171)	0.757*** (0.170)
Size squared	0.068*** (0.007)	0.068*** (0.007)	-0.095*** (0.005)	-0.095*** (0.005)	-0.019*** (0.005)	-0.019*** (0.005)
Fixed asset ratio	-0.270 (0.259)	-0.319 (0.259)	1.542*** (0.252)	1.581*** (0.252)	-0.422*** (0.154)	-0.424*** (0.151)
Fixed asset ratio squared	-1.001** (0.420)	-0.950** (0.418)	-2.474*** (0.368)	-2.516*** (0.368)	0.549** (0.249)	0.550** (0.243)
Sales growth	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000** (0.000)
Average tax	0.021* (0.012)	0.015 (0.013)	-0.013 (0.014)	-0.008 (0.014)	0.020*** (0.008)	0.020** (0.008)
Corporate tax	-0.003 (0.007)	0.008 (0.007)	0.000 (0.008)	-0.009 (0.008)	0.000 (0.003)	0.000 (0.004)
LEM	0.007** (0.003)	0.005* (0.003)	-0.017*** (0.003)	-0.016*** (0.003)	-0.004** (0.002)	-0.004** (0.002)
Observations	2976	2976	3296	3296	3294	3294
Adjusted <i>R</i> -squared	0.520	0.519	0.532	0.532	0.630	0.630

Coefficient estimates with standard errors shown in parenthesis (robust to heteroskedasticity). Both year effects and industry effects are included, but not reported. Dependent (firm performance) variables are the natural logarithm of the expense ratio (LER), the natural logarithm of the total asset turnover (LTAT) and the operating return on assets (OROA). In the two-stage least squares regressions, progressivity is treated as endogenous and the statutory top marginal income tax rate is used as an instrument. Leverage is measured as the ratio of firm liabilities to firm total assets. Size is measured by the natural logarithm of firm net sales. The fixed asset ratio is the ratio of firm fixed assets to firm total assets. LEM stands for legal environment measure (an index of corporate law). Variable definitions and data sources are provided in Table 3.1.

* Significant at 10%

** Significant at 5%

*** Significant at 1%

Table 3.5.
Regressions of firm performance on an alternative measure of personal-tax
progressivity

Independent variable	Dependent variable (and estimation method)					
	LER (OLS)	LER (2SLS)	LTAT (OLS)	LTAT (2SLS)	OROA (OLS)	OROA (2SLS)
Alt. progressivity measure	0.045 ^{***} (0.009)	0.026 ^{**} (0.013)	-0.030 ^{***} (0.010)	-0.018 (0.013)	-0.021 ^{***} (0.005)	-0.019 ^{**} (0.009)
Leverage	-0.120 ^{***} (0.026)	-0.119 ^{***} (0.027)	0.441 ^{***} (0.040)	0.441 ^{***} (0.040)	0.067 (0.092)	0.067 (0.092)
Leverage squared	0.006 ^{***} (0.002)	0.006 ^{***} (0.002)	-0.016 ^{***} (0.003)	-0.016 ^{***} (0.003)	-0.037 ^{***} (0.008)	-0.037 ^{***} (0.008)
Size	-2.638 ^{***} (0.232)	-2.637 ^{***} (0.231)	3.479 ^{***} (0.162)	3.482 ^{***} (0.161)	0.757 ^{***} (0.170)	0.758 ^{***} (0.170)
Size squared	0.068 ^{***} (0.007)	0.068 ^{***} (0.007)	-0.095 ^{***} (0.005)	-0.095 ^{***} (0.005)	-0.019 ^{***} (0.005)	-0.019 ^{***} (0.005)
Fixed asset ratio	-0.249 (0.259)	-0.300 (0.260)	1.541 ^{***} (0.253)	1.570 ^{***} (0.253)	-0.442 ^{***} (0.154)	-0.435 ^{***} (0.150)
Fixed asset ratio squared	-1.032 [*] (0.418)	-0.976 ^{**} (0.418)	-2.468 ^{***} (0.368)	-2.502 ^{***} (0.369)	0.573 ^{**} (0.250)	0.565 ^{**} (0.242)
Sales growth	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 ^{**} (0.000)	0.000 ^{**} (0.000)
Average tax	-0.010 (0.012)	-0.001 (0.013)	0.009 (0.014)	0.003 (0.014)	0.033 ^{***} (0.008)	0.032 ^{***} (0.008)
Corporate tax	0.005 (0.006)	0.010 (0.006)	-0.007 (0.007)	-0.011 (0.007)	-0.001 (0.003)	-0.002 (0.003)
LEM	0.006 ^{**} (0.003)	0.005 (0.003)	-0.016 ^{***} (0.003)	-0.016 ^{***} (0.003)	-0.004 [*] (0.002)	-0.004 ^{**} (0.002)
Observations	2976	2976	3296	3296	3294	3294
Adjusted <i>R</i> -squared	0.519	0.518	0.531	0.531	0.631	0.631

The alternative progressivity measure utilized in this regression is calculated in the same manner as the progressivity measure used in the main analysis, except that it is based on personal income tax only (other forms of state and local taxation are not considered in the effective tax rate used in the calculation). Coefficient estimates with standard errors shown in parenthesis (robust to heteroskedasticity). Both year effects and industry effects are included, but not reported. Dependent (firm performance) variables are the natural logarithm of the expense ratio (LER), the natural logarithm of the total asset turnover (LTAT) and the operating return on assets (OROA). In the two-stage least squares regressions, progressivity is treated as endogenous and the statutory top marginal income tax rate is used as an instrument. Leverage is measured as the ratio of firm liabilities to firm total assets. Size is measured by the natural logarithm of firm net sales. The fixed asset ratio is the ratio of firm fixed assets to firm total assets. LEM stands for legal environment measure. Variable definitions and data sources are provided in Table 3.1.

* Significant at 10%
** Significant at 5%
*** Significant at 1%

CHAPTER 4

CORPORATE LAW AND FIRM VALUE: CONSIDERING THE HETEROGENEITY OF “OTHER STATES”

Abstract

This paper investigates whether variations in state corporate law affect firm value. Previous research in this area generally treats all states other than Delaware as having homogeneous corporate law. I relax this assumption and find evidence that Delaware firms are worth more, on average, than non-Delaware firms. However, this effect is not consistent across all non-Delaware jurisdictions. Delaware incorporation appears valuable relative to incorporation in some states but not others, with valuation differences correlated to differences in statutory law. Specifically, corporate law that provides greater entrenchment of management is associated with reduced firm value. I also find evidence that domicile valuation impacts may be driven, in part, by non-statutory corporate law characteristics. The overall results are consistent across different firm size cohorts and are robust to controls for endogeneity caused by a potential selection bias.

JEL Classification: G30, G34, K22

Keywords: corporate law, corporate governance, investor protection, corporate control

4.1. Introduction

Corporate law is the law concerned with the creation and regulation of corporations. It determines, at least in part, the allocation of authority and process for making decisions regarding the firm and its resources. It deals with issues, such as: how takeover bids must be structured and decided upon; the election and organization of the board of directors; the duties and liabilities of directors and officers; how and when shareholder meetings are called; and various other procedures of corporate governance. In short, corporate law governs the relationship between shareholders and firm management.

Through its effect on investor rights and managerial obligations, corporate law has the potential to affect firm value. This relationship is borne out by several studies that examine international variation in the law.¹ While it is generally accepted that variation in the law across countries has a significant impact on the nature and effectiveness of corporate governance and, therefore, affects firm value, no similar consensus exists with respect to the impact of domestic variation in corporate law. In the US, the corporate law governing a firm depends on the firm's state of incorporation and firms can be incorporated in any of the 50 states (or the District of Columbia), regardless of the firm's actual physical location. Each state has its own unique corporate law and court system and firms select the body of law that will govern them by choosing an incorporation domicile. Within this system, Delaware has a unique role; over half of US

¹ A legal environment that provides greater investor protection appears to: increase firm value (La Porta, Lopez-de-Silanes, Shleifer and Vishny 2002; Klapper and Love 2004; Durnev and Kim 2005); decrease the voting premium in dual class equity structures (Zingales 1994; Nenova 2003; Dyck and Zingales 2004); and reduce the cost of capital (Bhattacharya and Daouk 2002; Himmelberg, Hubbard and Love 2004).

public firms and approximately 70% of new US IPO's are incorporated in Delaware (Daines 2002).

The merits of the current US system of corporate law have been debated for decades. Carey (1974) criticizes the system by arguing that states that offer a more pro-management legal environment will be more successful in attracting incorporations, since firm managers make the domicile decision and will decide based on self-interest. This, then, will lead to a competition between states to be the most pro-management in terms of their corporate law. This is known as the “race to the bottom” theory and Cary concludes that Delaware is winning the race to the bottom and must have the body of corporate law that is most desirable to management. Winter (1977) takes the opposite view and argues that if firms incorporate in states that have a legal environment that is disadvantageous to investors, the investors will demand a higher rate of return on their investment. Since firms need to minimize the cost of capital to be competitive, they will choose their domicile accordingly. Therefore, Delaware must be winning a “race to the top” by having a body of corporate law that is most desirable to investors. A third viewpoint, presented by Black (1990), argues that US domicile choice is trivial, since the variation in corporate law across states is limited and differences can be offset by substitute mechanisms that provide investor protections lacking in the law. These substitutes can include, among other things, security design and provisions in the firm charter or by-laws.

Much of the early empirical research directed at this issue consisted of reincorporation event studies (i.e. Hyman 1979; Dodd and Leftwich 1980; Romano 1985; Peterson 1988; Netter and Poulson 1989; Heron and Lewellen 1998). Existing firms can,

and occasionally do, change their legal domicile by reincorporating to a different state.² The event studies typically examine the change in the firm market value (of equity) that coincides with the decision to reincorporate. The abnormal stock return estimates vary considerably depending on the sample and control procedures. A number of studies found significantly positive valuation effects, consistent with the race to the top argument (Delaware law improves corporate governance). Other studies found insignificant effects, consistent with the legal domicile choice being trivial. Bebchuk, Cohen and Ferrell (2002) provide an overview of the reincorporation studies and calculate that the pooled weighted average abnormal return to reincorporation from eight different cited studies is 1.28%.

On the whole, the reincorporation event studies are mildly supportive both of legal domicile choice mattering and of Delaware corporate law benefiting shareholders. The methodology associated with these studies, however, suffers from a number of shortcomings that make interpretation of the results problematic. First, one must be able to identify the appropriate event window and it can be difficult to determine when the reincorporation decision was known and impounded in the share price. Second, there are often coincident events in the same timeframe that can have a confounding effect.³ Some of these coincident events are observable, such as the simultaneous announcement of planned changes to either the business strategy or the corporate charter and by-laws. There may also be confounding effects based on unobservable factors, such as the motive

² According to Daines (2002), between 1978 and 2000 there were approximately 600 reincorporations among publicly traded firms in the US (not including reincorporations associated with an IPO). Most reincorporations are into Delaware (Heron and Lewellen (1998) report that 87% of the reincorporations in their sample are into Delaware).

³ Romano (1985) reported that in a sample of reincorporations from 1960 to 1982, 72% had one or more coincident events (planned public offering, merger announcement or planned adoption of antitakeover provisions).

underlying the reincorporation decision. While there may be a statement of motives by management, the true motive will be inferred by the market and could result in a signaling effect on share prices that is not controlled for in the test procedure.⁴ Third, reincorporations are infrequent, leading to a relatively small sample size in these studies. Fourth, and finally, the typical methodology does not consider the heterogeneity of the resulting change in corporate law (i.e. the originating domicile states are implicitly considered to have the same legal environment).

Another area of related research also uses the event study methodology. It examines specific changes in state corporate law and how these changes impact the value of firms that are domiciled in that state. These studies typically examine the enactment of antitakeover legislation, which is generally thought to entrench managers and weaken corporate governance. Given the wide variety of statutes and alternative takeover defenses that firms may or may not have in place, it should not be surprising that there are less than uniform effects.⁵ There is, however, strong evidence that at least some of the antitakeover statutes adopted by states had a significant negative impact on shareholder wealth. These include disgorgement statutes (Karpoff and Malatesta 1995; Szewczyk and Tsetsekos 1992); Massachusetts' staggered board statute (Daines 2001b); and a variety of states' business combination, other constituencies and control share acquisition statutes (i.e. Ryngaert and Netter 1988; Karpoff and Malatesta 1989; Bertrand and Mullainathan 2003). While these studies suggest that excessive managerial entrenchment is bad for shareholders, they only examine the isolated effect of individual statutes. As such, they do not provide conclusive evidence that the overall corporate law

⁴ Heron and Lewellen (1998) provide a good discussion of motives and analyze differential reincorporation impacts based on the stated motive.

⁵ Bhagat and Romano (2001) provide a survey of corporate law event studies.

of certain states is notably inferior to that of other states, since other aspects of a state's corporate law may offset the effect of specific disadvantageous statutes.

The more recent research on this issue utilizes large cross-sectional (or panel data) firm samples and analyzes the relationship between overall firm value and legal domicile, while attempting to control for other relevant factors. An important and often cited paper by Daines (2001) found evidence that Delaware domiciled firms were worth significantly more than non-Delaware firms. Given the overwhelming popularity of Delaware as an incorporation domicile, the positive valuation effect is widely interpreted as evidence in support of the race to the top theory. This conclusion is drawn since it appears most firms prefer a domicile that appears to maximize shareholder value. Bebchuk, Cohen and Ferrell (2002) and Bebchuk and Cohen (2003) have criticized Daines' results and the inferences drawn from these results. Part of the criticism is based on concerns about a potential selection bias (i.e. more valuable firms may choose Delaware incorporation) and fluctuations in the size of the apparent Delaware effect. Daines results are also partially contradicted by the empirical findings of Subramanian (2004), who utilizes a more complex analytical procedure and includes more recent sample observations.

The research to date has focused, with somewhat mixed results, on comparing Delaware and non-Delaware domiciled firms. In this paper, the previous research is extended in two ways. First, an improved methodology is used to reexamine whether Delaware domiciled firms are worth more than non-Delaware firms. Second, the effect of legal domicile is examined without the restrictive grouping assumption used in previous research; specifically, I do not assume homogeneous corporate law in the "other US states" (the jurisdictions other than Delaware). Based on firm data from 1990 to

2004, I find evidence that: (1) Delaware firms are worth more, on average, than non-Delaware firms; (2) Delaware incorporation is valuable relative to some states but not others (however, there is no substantive evidence that Delaware corporate law is inferior to that of any other state); (3) the domicile valuation effect is driven, at least in part, by differences in statutory law, with high entrenchment jurisdictions being harmful to shareholder value; and (4) there may be domicile valuation effects that are driven by factors other than the existence or absence of certain statutes (there may be value associated with the body of case law, the organization of the court system and the expertise of the judiciary).

The remainder of the paper is organized as follows. Section 4.2 reviews, in greater detail, the previous cross-sectional research on state law and firm value. Section 4.3 describes the empirical methodology, which includes various model specifications designed to assess domicile effects using less restrictive grouping assumptions than used in previous research. The main empirical findings are presented in Section 4.4. Section 4.5 includes robustness tests and examines some specific issues arising from the empirical results. Section 4.6 concludes.

4.2. Prior Research: Cross-Sectional Evidence on the Effect of State Law on Firm Value

There have been two major published studies that have examined large sample, cross-sectional data to analyze the valuation effect of US incorporation domicile. These are Daines (2001) and Subramanian (2004). Daines examines the relationship between Delaware incorporation and firm value, as measured by an approximation of Tobin's Q.

A sample of 4,481 exchange-traded firms, with observations from 1981-1996, is analyzed using pooled sample, annual cross-sectional and fixed effect regressions. Firm value is regressed on a dummy variable representing Delaware incorporation and a set of variables to control for firm profitability, size, investment opportunities, diversification and industry. The sample was trimmed (based on Tobin's Q) to deal with the effect of outlier observations and robustness checks were performed to address certain potential endogeneity problems. The analytical results suggest that Delaware domiciled firms were worth significantly more (as much as 2%, on average, more) than similar firms incorporated in other states during the sample period. Daines hypothesizes that the source of the added value is that Delaware corporate law is more favorable to both takeover bids and successful acquisition; this contention is then supported by an analysis of bid and acquisition data.

Subramanian (2004) extends Daines work by examining a sample that includes observations from a more recent period (Subramanian's sample consists of 11,251 firms with observations from 1991-2002). Subramanian also refines the methodology to address what he argues are econometric limitations in Daines' empirical model. First, Subramanian notes that Daines' procedure of trimming the sample is inadequate to deal with the effect of outlier observations, which exist in both the Tobin's Q values and the return on assets (ROA) values.⁶ To address this problem, Subramanian subjects the Q and ROA variables to a quantile transformation prior to regression analysis.⁷ Second,

⁶ Subramanian reports that extreme values for Tobin's Q exist even after trimming the upper and lower 10% of the observations; Daines reports results with the upper and lower 1% of the observations trimmed (although he states that similar results are found with 5% or 10% trimming or no trimming). The potential effect of extreme ROA observations is not explicitly addressed by Daines' procedure.

⁷ Instead of using the raw value of the variable in the regression, the variable's percentile rank in the observation year is used, so that the variable is bounded at [0,1] and it is its relative value rank that is used in the regression estimation.

since Delaware incorporated firms are larger, on average, than non-Delaware firms, Subramanian argues that more precise controls for firm size should be included in the regression model. In his regression model, he includes dummy variables associated with eight size categories (based on net sales with cutoffs at \$50 million, \$100 million, \$250 million, \$500 million, \$1 billion, \$2.5 billion and \$5 billion) and interactions between these dummy variables and the log of net sales. Third, Subramanian argues that there may be cluster effects based on the firms' location of operation. As such, he includes a dummy variable corresponding to each state (the dummy variable equals one if the firm is headquartered in that state and equals zero otherwise).

Apart from these modifications, Subramanian's model is similar to that of Daines; he uses an approximation of Tobin's Q as the dependent variable, has the same independent variable of interest (a Delaware incorporation dummy variable) and the same control variables. Subramanian does not perform fixed effects regressions, noting that it suffers from the same econometric shortcomings as reincorporation event studies, and he does not perform pooled sample regressions, due to concerns about autocorrelation. In the annual cross-sectional regressions, Subramanian finds evidence that in the period from 1991 through 1996, Delaware incorporated firms were worth significantly more than non-Delaware firms. This is consistent with Daines' results. In the 1997 through 2002 period, he found no significant difference in the value of Delaware and non-Delaware firms. Subramanian also splits the sample into sub-samples based on size and reruns the regressions and finds evidence that the positive Delaware effect in the 1991 through 1996 period does not apply to larger firms (firms with net sales of more than

\$100 million). In summary, he concludes that the positive Delaware effect identified by Daines only existed for small firms and that the effect no longer exists.

4.3. Methodology

4.3.1. Sample

Similar to Daines (2001) and Subramanian (2004), I create a sample of publicly traded firms from the Compustat database; both the active and research files are used to avoid survivorship bias. Financial data is retrieved for all firms traded on a major exchange (NYSE, AMEX or NASDAQ) for the 1988-2004 period. I omit regulated utilities (SIC codes 4900-4999) and financial services firms (SIC codes 6000-6999), since federal and state regulation of these sectors affects the corporate governance of such firms. Similarly, firms with dual-class common stock are removed from the sample since the concentration of voting power significantly alters the relationship between insiders and typical shareholders, making comparison to single-class firms problematic (Gompers, Ishii and Metrick 2003). That corporate law may have different impacts on single-class and dual-class firms is reinforced by evidence that dual-class firms are largely immune from hostile takeovers (Daines and Klausner 2001). In addition, I remove: non-US firms (firms incorporated or whose primary location of operation is outside the US); subsidiaries; duplicate entries; and firms with no sales. Further excluding firm observations with missing data for one or more of the key variables, leaves a final sample of 3,173 firms representing 21,070 firm years between 1990 and 2004.⁸

⁸ Lagged data requirements associated with the variable construction and regression model meant that firm year observations are not available for the first two years (1988 and 1989) of the original sample period.

Since the Compustat database only provides current domicile and current primary location information for each firm, it was necessary to obtain historical domicile and location data from archived Compustat CD ROMs. This data was matched to the firm financial data drawn from the most recent Compustat CD ROM.⁹ Matching was based on the CUSIP number (security issuer number) or, failing that, the firm name. Since both these identifiers are potentially subject to change over time, this resulted in the loss of observations due to a failure to identify the domicile or location for some firm years, particularly in the earlier portion of the sample period. Table 4.1 provides summary statistics for the key variables in the sample.

4.3.2. Replication and Model Refinement

In order to determine the most appropriate empirical model to investigate domicile effects on firm value, I began by performing regressions using the models specified by Daines (2001) and Subramanian (2004). This replication was done to investigate the econometric properties of these models. Using Daines' model for the period of overlap between his sample and mine, I get similar results, with Delaware incorporation having a positive and statistically significant effect on firm value. To investigate the effect of outliers, I trim the sample at different levels (untrimmed, 1% and 5%) and I find that the coefficient estimates and their significance are somewhat sensitive to the alternative trimming procedures.¹⁰ An examination of the summary statistics in Table 4.1 also supports Subramanian's contention that Daines' model may be subject to

⁹ The data set was downloaded in July 2005. As such, the 2004 sample does not include observations for all firms due to the timing of the release of annual report information for some companies.

¹⁰ Daines reports that his estimates are not sensitive to alternative trimming procedures. The sensitivity in my replication may be due to the smaller sample size or different firm inclusion rules in my sample (i.e. no dual class firms, etc.).

an outlier problem. Extreme values in the variables exist, particularly for Tobin's Q and ROA, which is not addressed by simply trimming the sample based on Tobin's Q at the 1% or 5% level (and trimming at the 10% level would result in a large reduction in the sample size).¹¹

Using Subramanian's model, with quantile transformations of Tobin's Q and ROA, appears to alleviate the outlier problem. Coefficient estimates and their significance become stable relative to different sample inclusion rules (untrimmed or trimmed at different levels). The coefficient estimates I obtain, particularly for the variable of interest (Delaware incorporation dummy), are similar to Subramanian's in terms of magnitude, sign and statistical significance. The overall model fit is improved, relative to Daines' model, as reflected in a much larger adjusted R-squared. Furthermore, several of the size related variables introduced by Subramanian are statistically significant, indicating that his more precise size controls are appropriate.

One feature of Subramanian's model that appears problematic is the inclusion of state dummy variables related to a firm's headquarters location. This location effects control procedure introduces up to 50 additional control variables and I find little evidence of explanatory power in these variables. In annual cross-section regressions, very few state dummies have coefficients that appear statistically significant. Furthermore, the state dummies that appear statistically significant are generally associated with states that contribute very few observations. For example, in a regression for 2002, there were 47 state dummies included (based on 48 states being represented in

¹¹ A related concern with Daines' model, not mentioned by Subramanian, is that the regression residuals resulting from the model are skewed with a high level of kurtosis. With regression residuals that are not normally distributed (or not approximately normally distributed), the standard statistical tests of the coefficient estimates are only asymptotically valid. The Subramanian model specification results in residuals that correspond much more closely to a normal distribution.

the sample). Only four of the 47 state dummies appeared statistically significant at the 10% level. Given this, the relevance of state effects, in general, is questionable, since so few state location dummies appear statistically significant. Furthermore, the four state dummies that did appear statistically significant are associated with states that contributed very few observations (none of these four states contributed more than four observations in that sample year). As such, the apparent statistical significance of these four state dummies is highly suspect, since it is based on so few observations (so few observations from those states).¹² In addition, there is evidence of instability in the coefficient estimates of these apparently significant state dummies (in some cases the coefficient changes sign in regressions associated with successive years). This suggests that such a model may be subject to a significant overfitting problem; it may include a large number of irrelevant independent variables. This increases the standard error of the coefficient estimates for the other independent variables, which would tend to obscure the relationship between the relevant independent variables and the dependent variable.

There is little basis for this type of extensive location control procedure. Past research explaining Tobin's Q in US firms does not typically include any type of state effects control. Furthermore, since the sample consists of large firms, it is expected that many of the firms would have significant operations and sales in many states (or in other countries) and, as such, the influence of factors in their headquarters state would be limited. The argument that Subramanian makes for including location controls is that firms from certain states may be over or underrepresented in the Delaware domicile

¹² The dummy variable associated with a state that contributes very few (i.e. less than 5) observations is much more likely to appear significant, even when it has no effect on the dependent variable. This is because it is more likely that the average of the true residuals associated with those observations will be further from zero, which can result in a spurious correlation.

category and that this “mix effect” may bias the results. He provides the example of California, noting that California firms represent 22% of firms incorporated in Delaware but only 11% of his overall sample. As such, California is overrepresented in the Delaware domicile category. If California firms are worth more (or less) than similar firms located elsewhere, then an apparent domicile effect may in fact be due to a failure to control for a location effect.

Even if the location affects firm value (which I have no evidence of), for states that contribute very few observations to the overall sample, the over and under representation of high-value-state (or low-value-state) firms in the Delaware domicile category should balance out.¹³ States that contribute a larger portion of the sample observations could, however, potentially bias the results. In light of this, some level of control for location effects may be warranted, although a more parsimonious set of control variables would seem most appropriate.

I include state dummies for location categories that have sufficient information content to contribute econometrically to the model.¹⁴ As such, a specification is tested that includes location state dummies for each state that contributes a minimum of 5% of the observations. I find, based on the Schwarz criterion score, that the goodness of fit of such a model is superior to that of a model that has a full set of state dummies (it is also superior to having no controls for location effects). This alternative, more parsimonious, location control procedure addresses the potential “mix” problem noted by Subramanian, but also guards against the problems associated with overfitting.

¹³ Assuming that the over and under-representation is random.

¹⁴ A dummy variable has no information content if its value is zero (or one) for every observation. The information content increases as the certainty of the value the dummy variable will take decreases, as such, a mean value for the dummy variable further from zero (and further from one) indicates that the dummy variable conveys more information (Garavaglia and Sharma 1998).

4.3.3. Model Specification

Based on the performance characteristics of the previously discussed models and the desire to test domicile effects under various grouping assumptions, I use the following empirical model in the regression tests:

$$Q'_{it} = a + bD_{it} + cF_{it} + e_{it} \quad (1)$$

Q'_{it} is the quantile transformation of Tobin's Q (percentile rank of the firm's Tobin's Q within that observation year), where Tobin's Q is estimated following the Kaplan and Zingales (1997) method.¹⁵ D_{it} is a vector of domicile variables (a Delaware incorporation dummy or a set of dummies representing various incorporation states or groups of states); this is discussed further in Subsection 4.3.4. F_{it} is a vector of firm characteristics. As elements of F , I include the following: (1) quantile transformations of ROA and lagged ROA, to control for firm profitability; (2) the log of net sales, a set of size category dummies (also based on net sales with category cut-offs at \$50 million, \$100 million, \$250 million, \$500 million, \$1 billion, \$2.5 billion and \$5 billion) and interactions between the size dummies and the log of net sales; (3) R&D expenditures scaled by assets, to control for investment opportunities; (4) the number of reported business segments, to control for diversification; (5) a set of industry dummies (based on two digit primary SIC); and (6) a set of state dummies corresponding to the firm's

¹⁵ Tobin's Q is calculated as the market value of assets divided by the book value of assets, where the market value of assets is computed as the book value of assets plus the market value of common stock minus the book value of common stock minus the book value of deferred taxes. This is the same method of computation used by Subramanian (2004) and several other corporate governance researchers (i.e. Gompers, Ishii and Metrick (2003), La Porta, Lopez-de-Silanes, Shleifer and Vishny (2002)).

primary location of operation (state dummies are included for each state that contributes 5% or more of the observations).¹⁶

The specification essentially follows that of Subramanian (2004) with two exceptions. First, I use a more parsimonious location control procedure, which avoids introducing a large number of seemingly insignificant state dummies.¹⁷ Second, I test for domicile effects using both the traditional approach (a single domicile dummy representing Delaware incorporation) and alternative approaches to grouping legal domiciles.

4.3.4. Domicile Categories

In the empirical model, I include a vector denoted D_{it} , which is the vector of domicile variables. The traditional approach to assessing domicile effects is to include only one variable in this vector, which is a dummy variable representing incorporation in Delaware. This approach is appropriate for assessing whether Delaware domiciled firms are worth more, on average, than similar firms incorporated elsewhere. While this is an important question, given Delaware's unique role in the US system of corporate law, it does leave other potentially important questions unanswered. If we are interested in the

¹⁶ ROA is defined as the current-year operating income after depreciation divided by the total assets from the prior year. Net sales are inflation adjusted using the US Consumer Price Index and 2004 as the base year. Segment data was not available prior to 1998 and, as such, segments is excluded from the control procedure for regressions involving earlier years. State tax policy is not specifically controlled for in the regressions, since the sample, unlike that used in Chapter 3, consists of many large firms. These firms have significant operations in many states and/or multiple countries and are therefore subject to the tax policies of multiple jurisdictions. Alternative proxies for growth opportunities (sales growth and lagged capital expenditures) were also tested, but not reported, with similar results in terms of the legal environment variables of interest.

¹⁷ Although not reported, I obtain similar results with a more comprehensive location control procedure that includes location state dummies for each state that contributes a minimum of 2% of the sample observations. Furthermore, the results are consistent across different firm-size cohorts; presumably, state location effects would be irrelevant in larger firms that operate on a national or international basis.

effect of law on firm value, then simply comparing Delaware and non-Delaware firms may not be sufficient to determine if state corporate law has valuation impacts. Suppose some states have superior corporate law and some states have inferior corporate law (relative to Delaware) and these differences affect the value of firms domiciled in different states. This impact of corporate law would not necessarily be apparent by simply comparing Delaware firms to an aggregated group of non-Delaware firms. The traditional approach implicitly assumes that all jurisdictions, other than Delaware, are alike.

An examination of the corporate law statutes, particularly takeover statutes, across US states indicates that there is potentially significant variation in state corporate law. For instance, Bebchuk and Cohen (2003) present state data on five specific types of antitakeover statutes.¹⁸ Several states have adopted none of these types of statutes, while several other states have adopted all five. Furthermore, while Delaware is not near the average of 2.7 statutes adopted, it is also not at the extreme of the spectrum (eight states have adopted none of the antitakeover statutes, while Delaware has adopted one).¹⁹ This suggests that there may be corporate law induced differences in firm value across the non-Delaware states and that Delaware corporate law may be valuable (or harmful) relative to some states but not others.

Given the corporate law variation among states (other than Delaware) and the recognition that Delaware may not have the best (or worst) corporate law, I identify three

¹⁸ The types of antitakeover statutes examined were: control share; fair price; no freeze-outs (a.k.a. business combination); poison pill endorsement; and constituencies. Obviously other statutory differences will exist between states and state case law also affects investor rights.

¹⁹ Delaware corporate law may be closer to the average than it appears. Although Delaware does not have a poison pill endorsement statute, the absence is practically irrelevant since case law in Delaware has essentially the same effect (Bebchuk and Cohen 2003).

alternative specifications to test whether a firm's domicile affects its value. In Model 1, the domicile categories are driven by considerations of sample adequacy; I assign a state domicile dummy to each state that is the legal domicile to at least 2% of the overall sample. This results in 11 domicile dummy variables, with the omitted category (baseline group for comparison) being the group of all states that individually contribute less than 2% of the firm observations. This specification allows us to directly test whether Delaware incorporated firms are worth more, on average, than similar firms incorporated in states that are the legal domicile to few firms.

In Models 2 and 3, I use statutory differences and state legal reputation to guide the specification. In Model 2, I assign a dummy variable to each state that is reputed to have a potentially unique body of corporate law. This includes Delaware, for obvious reasons. It also includes Massachusetts, Ohio and Pennsylvania, which have been called "notorious" based on their adoption of unusual and extreme antitakeover statutes (Daines 2001; Bebchuk and Cohen 2002).²⁰ Nevada is also assigned a unique dummy variable, based on its reputation as "the Delaware of the West" and its success in attracting out of state firms to incorporate there. The remaining 46 domiciles are grouped into one of three categories based on whether the statutory law is deemed to be low, moderate or high in terms of entrenching management. A state is placed in the low category if it has adopted none of the five types of antitakeover statutes previously noted as being summarized by Bebchuk and Cohen (2003) or if the state is one of the five states with the lowest legal environment measure (as generated by Ferris, Lawless and Noronha

²⁰ Ohio and Pennsylvania have passed disgorgement statutes (a hostile bidder crossing a certain ownership threshold must disgorge any short term trading profits they may make on their shares over an 18 month period) and Massachusetts has passed a staggered board statute. For both types of statutes, it is possible for firms to opt out, however, the statutory provisions are the default arrangement that apply to firms incorporated in these states.

(2004)).²¹ A state is placed in the high category if it has adopted all five antitakeover statutes or if the state is one of the five states with the highest legal environment measure. All remaining states are grouped in the moderate category. The result is 9 states and the District of Columbia in the low category, 7 states in the high category and 29 states in the moderate category. There are a total of eight domicile categories, so seven dummy variables are included in the model, with the ‘high entrenchment’ category serving as the omitted category (baseline group for comparison) in the regressions.

In Model 3, I assign a unique dummy variable for incorporation in Delaware. The “notorious three,” Massachusetts, Ohio and Pennsylvania, are grouped together in one category, representing states with a reputation for bad corporate law (law that is harmful to shareholders). The remaining states form a third and final category. In this model, the result is three domicile categories and two dummy variables included in the model, with the notorious states serving as the omitted category (baseline group for comparison) in the regressions.

Each of the four models (the traditional model and the three alternatives described above) utilizes different grouping assumptions, with the latter two models using grouping categories that are driven by theory, in that we may expect that states with similar statutory law (or a similar reputation for corporate law) to have similar valuation effects on the firms domiciled there. This may shed additional light on the effect of corporate law, over the arbitrary, at least in some respects, bimodal categorization of Delaware and

²¹ The legal environment measure (LEM) constructed by Ferris, Lawless and Noronha (2004) is an index that measures the presence and speed of adoption of pro-management corporate law statutes. A high LEM would indicate greater entrenchment of management. I utilize both information on the antitakeover statutes summarized by Bebchuk and Cohen (BC) (2003) and the LEM index in order to take into account the effect of more statutes. In addition to accounting for control share, business combination and constituencies statutes that are part of the BC list of standard statutes, the LEM index takes into account five other types of statutes (indemnification; director & officer exculpation; appraisal right exception; short-form merger; and first generation antitakeover).

non-Delaware. For convenience, descriptions of each of the four models are summarized in Table 4.2.

4.4. Firm Value and Legal Domicile

4.4.1. Firm Value and Legal Domicile: Delaware Versus Non-Delaware Incorporation

Our initial examination of domicile effects utilizes the traditional approach, which relies on a single dummy variable representing incorporation in Delaware. The intention is to test whether there is any difference in the value of Delaware and non-Delaware firms, while controlling for other factors. A summary of the regression results is presented in Table 4.3. Regression coefficient estimates are based on ordinary least squares (OLS) estimation and are presented with robust standard errors (for the annual regressions the standard errors are robust to heteroskedasticity and for the pooled sample regressions they are robust to arbitrary serial correlation and time-varying variances in the disturbances).²²

In several respects the results are consistent with those of Subramanian (2004). Subramanian found evidence that Delaware incorporation had a positive and statistically significant affect on firm value in the 1991-1996 period, with coefficient estimates (based on annual cross-sectional regressions) ranging from 0.015 to 0.028. During a similar timeframe, my regressions yield comparable results. A pooled sample regression for the 1990-1997 period results in a Delaware coefficient estimate of 0.027, which is statistically significant at the 1% level. I also find similar coefficient estimates in annual

²² An alternative method of dealing with serial correlation in the pooled sample regressions is to perform generalized least squares (GLS) estimation. Although not shown, a feasible GLS technique (random effects) was also used to estimate regression coefficients. This alternative method provided similar results.

regressions from 1990 through 1997, with the coefficient positive in all years and statistically at the 10% level in five of the eight years.²³

Subramanian also presented evidence that the Delaware effect declined and was insignificant in the latter portion of his sample period (1997-2002). This is also generally consistent with my regression results. In the 1998 through 2002 period, although the estimated Delaware coefficient is positive in four of the five years, it is only statistically significant in one of the years (1999). In the two most recent years of my sample, 2003 and 2004, which were not included in Subramanian's results, there is evidence that the positive valuation effect of Delaware incorporation may have reemerged. In both years, the coefficient is positive, and it is statistically significant at the 1% level in 2003 and at the 5% level in 2004.

The full-period pooled sample results are supportive of a positive effect of Delaware incorporation. When the overall sample period is split into early and recent sub-periods, there is also evidence supporting the positive effect of Delaware incorporation, although the effect is less pronounced and has a lower level of statistical significance in the 1998-2004 sub-period. Combining these results with those of Daines' (2001) for the pre-1990 period, Delaware firms appear to be more valuable than similar non-Delaware firms in 23 of the 24 years from 1981 through 2004, with the difference being statistically significant at the 10% level in 15 of the 24 years. Interestingly, the 1998 through 2002 period, which does not provide results consistent with the overall findings, coincides with the rise and fall of technology stocks associated with the so-

²³ Results for each individual year in the early portion of the sample period are not presented due to space limitations. In annual regressions for 1990 through 1997, the Delaware coefficient estimate was in the range from 0.026 to 0.030 for all years, except 1993, which was 0.011. The estimates were statistically significant in five of the eight years at the 10% level, with three of these year's estimates also significant at the 5% level.

called internet bubble. Whether this unusual market activity was the cause of the weaker results in the more recent sub-period or whether the apparent Delaware effect has dissipated due to changes in Delaware law, as suggested by Subramanian, is open to interpretation.

4.4.2. Firm Value and Legal Domicile: Alternative Models

The alternative models compare the value of Delaware incorporated firms to firms in more specific alternative domicile categories. The regression results are presented in Table 4.4 and, as before, are based on least squares estimation and are presented with robust standard errors. In Model 1, the omitted domicile category (the baseline group for comparison) is the group of states that are, individually, the legal domicile to few publicly traded firms. This is conceptually similar to the traditional model, in that I am comparing Delaware and non-Delaware firms, however, in this specification I control for the valuation effects of the corporate law of ten other states.²⁴ The Model 1 results are summarized in Panel A. The estimated coefficient on the Delaware dummy was larger in every regression (except 1997 (not shown)) than that estimated with the traditional model. Overall, the Delaware firms appear to be worth more, on average, than similar firms incorporated in one of the states that is the legal domicile to few publicly traded firms. The effect is strong in the early half of the sample and in the last two sample years. Less significant domicile effects appear in the 1998-2002 period, although the estimated coefficient is positive in all years.

²⁴ How the Delaware coefficient compares to the coefficients associated with these ten other specific states is discussed later in Subsection 4.4.3.

In Model 2, the omitted domicile category is the group of states that have a body of corporate law that is associated with higher levels of managerial entrenchment. The corporate law of these states tends to shelter management from the threat of corporate takeover, by making takeovers more expensive and/or by giving insiders greater flexibility or authority to fight a hostile takeover. The Model 2 results are summarized in Panel B. Here, the estimated coefficients on the Delaware dummy variable tend to be larger and tend to have greater statistical significance. In both the full period pooled results and in both sub-period pooled results, the Delaware coefficient is positive and statistically significant at the 1% level. In the annual regressions, the coefficient is positive in all 15 annual regressions and is statistically significant (at the 10% level) in 12 of the 15 years.²⁵ The difference in value between Delaware firms and firms domiciled in high entrenchment states appears to be much more pronounced than the difference in value between Delaware firms and all non-Delaware firms. Interestingly, the estimated coefficients on a number of other included domicile category dummies are positive and statistically significant. Firms domiciled in the low and moderate entrenchment states appear to be worth more, on average, than similar firms domiciled in the high entrenchment group of states. This is particularly true in the latter portion of the sample period. Both the increased Delaware coefficient estimates (versus Model 1 or the Traditional Model) and the positive and significant coefficients for the low and moderate

²⁵ Again, I have chosen not to present results for each individual year in the early portion of the sample period due to space limitations. The results presented for 1990, 1996 and for the pooled 1990-1997 period are representative of the omitted results.

entrenchment states are consistent with entrenching antitakeover legislation being harmful to shareholders.²⁶

Although not shown, regressions were also run with a slight modification to Model 2. In these regressions, all states (including Delaware, Massachusetts, Nevada, Ohio and Pennsylvania) are classified into the high, moderate and low entrenchment categories.²⁷ Again, I find evidence that firms domiciled in the low and moderate entrenchment states are worth significantly more, on average, than similar firms domiciled in the high entrenchment group of states.

In Model 3, the omitted domicile category is the group of states consisting of Massachusetts, Ohio and Pennsylvania (MOP), which have passed unusual and extreme antitakeover legislation that may be harmful to shareholders. The Model 3 results are summarized in Panel C. The pooled sample regressions suggest that Delaware incorporated firms were worth significantly more than MOP firms in the most recent sub-period (1998-2004), but were not significantly different than MOP firms in the earlier sub-period (1990-1997). This is confirmed by the annual regression results. From 1990 through 1997, although the estimated Delaware coefficient was positive in every year, it was only statistically significant in one year (1994). However, from 1998 through 2004, the estimated Delaware coefficient tended to be larger, was positive in every year and was statistically significant in five of the seven years.

Although somewhat less pronounced, a similar pattern emerges when firms domiciled in other states (not Delaware and not MOP) are compared to MOP firms. The

²⁶ Although a cursory inspection of the coefficient estimates may suggest that this effect is non-linear, since the firms in the low entrenchment states do not necessarily appear to be more valuable than the Delaware or moderate category firms.

²⁷ Based on the same, previously used, categorization rules, Delaware and Massachusetts fall into the moderate category and Nevada, Ohio and Pennsylvania fall into the high category.

evidence suggests that firms from other states were more valuable, on average, than similar firms domiciled in Massachusetts, Ohio or Pennsylvania in the most recent sub-period. However, prior to 1998, there is no evidence of a difference in value between the MOP firms and the firms domiciled in other states. This makes interpretation of the results somewhat difficult, since the unique antitakeover legislation of these states was passed in early 1990's. Given this, it can be argued that the valuation impact of the legislation should appear in the early portion of the sample period and, since it does not, the lower valuation of the MOP firms in the latter half of the sample must be attributed to some other cause (the result must be spurious). Alternatively, the market's assessment of the impact of the legislation may have changed over time. This could occur if the legislation had unanticipated demonstrable effects that were played out over time. While the antitakeover legislation may have been seen as benign or only mildly harmful in the early period, market participants may have changed their opinion over time and eventually considered the legislation significantly harmful in the latter years.

4.4.3. Domicile Valuation Effects and the "Race" Theories

Both the research on domicile valuation effects (i.e. Daines (2001) and Subramanian (2004)) and on factors that determine domicile choice (i.e. Daines (2002) and Bebchuk and Cohen (2003)) are generally concerned with addressing a larger issue – specifically, is the current US system of corporate law a good one or not. The race to the bottom theory (Cary 1974) suggests that it is not. It argues that domiciles that favor management (and harm shareholders) will be the most popular incorporation jurisdictions and state competition for corporate charters will lead to a deterioration of corporate law.

The race to the top theory (Winter 1977) suggests that the current US system of corporate law is a good one. Under this theory, domiciles that maximize shareholder value will be the most popular incorporation jurisdictions and state competition will improve firm law. As appropriately pointed out by Bebchuk, Cohen and Ferrell (2002), the race theories consist of joint propositions and each proposition must be supported to validate either of the theories. A simple expression of the component propositions is as follows: (1) the legal domicile (state corporate law) affects firm value; (2) state corporate law affects the domicile preference (how it affects preference determines which race theory you are referring to); and (3) states compete for incorporations. The analysis in this paper focuses on the first proposition and the evidence presented in Subsections 4.4.1 and 4.4.2 suggests that there are domicile valuation effects.

Instead of attempting to provide definitive support for either theory, I will address a much simpler question that does not require us to consider the third proposition. This question is whether Delaware corporate law is at least as good, in terms of firm value, as that of other US domiciles. We have presented evidence that Delaware firms are worth more, on average, than firms incorporated in specific alternative domiciles. We have not, however, addressed specifically whether there may be other legal domiciles that are superior to Delaware in terms of maximizing firm value.

Delaware is, by far, the most popular incorporation domicile and its dominance appears to be growing (Daines 2002). If the most preferred domicile maximizes shareholder value (or at least does not harm shareholder value), we would have strong evidence to suggest that the race to the bottom theory should be rejected. To address this question, I use *t*-tests to compare the Delaware coefficient estimate to the coefficient

estimate of alternative domicile categories. The null hypothesis is that Delaware incorporation is at least as valuable as that of other incorporation domiciles. The one sided alternative hypothesis is that Delaware incorporation is less valuable. The empirical test results are summarized in Table 4.5.

Overall, I find no substantial evidence that Delaware firms are worth less than firms incorporated in alternative domiciles. In Model 1, the estimated coefficients associated with California, Florida, Minnesota and Nevada incorporation are larger than that estimated for Delaware. However, for California and Nevada the difference was not statistically significant and for Florida and Minnesota the difference was only statistically significant at the 10% level (none of the differences was statistically significant at the 5% level). This would, at best, constitute weak evidence that incorporation in one of these alternative domiciles is superior to incorporation in Delaware.²⁸ With respect to Models 2 and 3, I find no statistically significant evidence that Delaware domiciled firms are worth less than firms incorporated in any of the alternative domicile states (or groups of states).

Given the evidence from the previous subsections (subsections 4.4.1 and 4.4.2) that Delaware firms are worth more than firms incorporated in some alternative domiciles; the lack of evidence (noted above) that Delaware firms are worth less than firms incorporated in any alternative domiciles; and Delaware's overwhelming dominance as the domicile of preference, I must conclude that the evidence is not consistent with the race to the bottom theory.

²⁸ The evidence is considered weak given: (1) the modest level of statistical significance (the lowest p-value for any of the one sided tests was 0.074); and (2) a lack any theoretical basis for suggesting that Florida or Minnesota incorporation would be valuable relative to incorporation in Delaware (all three states fall into the moderate entrenchment classification associated with Model 2).

4.5. Discussion and Analysis of Robustness

4.5.1. Other Controls

The omission of relevant control variables may bias the regression results and lead to the appearance of domicile valuation effects when none exist. In order to partially address this concern, I consider a number of potentially relevant variables that were not included in the control procedure. Morck and Yang (2001) present evidence that firms included in the S&P 500 index are more valuable than similar firms not included in the index. In addition, the level of firm debt may affect the value of corporate tax shields and also institutional monitoring and managerial incentives.²⁹ As such, the debt ratio may impact firm valuation. To address these two potential factors, regressions were run (not shown) for each model, which included a dummy variable for S&P 500 membership and also the debt-asset ratio. This revised control procedure led to very similar coefficient estimates for the domicile variables and would lead to the same conclusions regarding their statistical significance. I also test for bias based on a failure to control for firm age. Similar to Shin and Stulz (2000), I define firm age based on how long firm data is available in the Compustat database. I then repeat regressions, including only those firms that are at least six years old (the five year lagged market price is available in the database). Again there is no substantial change in the domicile coefficient estimates or the conclusions drawn regarding their significance.

In addition to the debt ratio, other aspects of the firm's ownership structure, particularly managerial ownership, may be expected to affect firm value (Morck, Shleifer

²⁹ For example: regarding tax shields, see Modigliani and Miller (1963) regarding monitoring and incentives, see Grossman and Hart (1982) and Jensen (1986).

and Vishny 1988; McConnell and Servaes 1990). Due to data restrictions, I have not controlled for managerial ownership. Daines (2001) does a robustness check by controlling for managerial ownership in a sub-sample of firms. He finds that this additional control does not impact his results regarding domicile effects. Furthermore, he notes that previous research (Baysinger and Butler 1985; Choi, Kamma and Weintrop 1989) indicates that managerial ownership is not correlated to Delaware incorporation, which also mitigates concerns about potential bias in the regression results.

The failure to control for ownership characteristics or other aspects of corporate governance that are internal to the firm may be expected to bias the test results against finding domicile valuation effects. If the legal characteristics of certain domiciles entrench management and raise agency costs, we may expect that internal mechanisms of corporate governance would adjust to partially offset the negative impacts. Failing to control for such internal mechanisms, which may be endogenous, would actually obscure the effect of external governance mechanisms such as corporate law.

4.5.2. Potential Endogeneity Associated with Selection Bias

Bebchuk, Cohen and Ferrell (2002) argue that a correlation (or partial correlation) between a firm's legal domicile and a firm's value does not prove that the firm's domicile affects its value. They suggest that the source of correlation between Delaware incorporation and firm value may be reverse causation; firms with a higher value tend to incorporate in Delaware. In order to test whether this alternative explanation is driving my main results, I follow Daines (2001) and repeat the regressions using the subset of firms whose domiciles have remain fixed for a minimum of ten years. Even if factors

outside the control procedure (factors which affect firm value), played some role in determining the firm's domicile, it is quite likely that those factors will have changed in the more than ten years since the domicile choice was made. In this sense, the domicile of this subset of firms is relatively exogenous. Hence, it is less likely that a selection bias could be responsible for any partial correlation that may be found.

Based on the requirement to have ten previous years of domicile data, I am left with a pooled sample of 3,429 annual observations for 939 firms for the 2000-2004 period. The regression results are presented in Table 4.6. The overall results are consistent with those derived from the full sample. In all four specifications, the estimated Delaware coefficient is positive and similar in magnitude to that estimated based on the full sample. Despite the reduced sample size, the Delaware coefficient is statistically significant at the 10% level in all four specifications and at the five percent level in Models 1, 2 and 3. The analysis, based on this set of firms with mature domiciles, suggests that the main results are not driven by a selection bias.

4.5.3. Domicile Effects by Firm Size

Subramanian (2004) presented evidence that the Delaware domicile effect was different for large and small firms. Specifically, in the period in which he found evidence of a positive effect in the overall sample, it only appeared to occur in small firms. The methodology used consisted of partitioning the sample into different size cohorts and running separate regressions for each cohort. In order to test whether the domicile effects that I find in my main results are robust to firm size, I follow a similar methodology. My sample is split into two sub-samples, one associated with small firms and one associated

with large firms. The cut-off is set at \$100 million in net sales, since Subramanian found no evidence of a Delaware effect in firms larger than this.³⁰ Regressions associated with the two size-based sub-samples are presented in Table 4.7.

As expected with regressions with fewer observations, the statistical significance declines when compared to the full sample regressions presented previously. However, in all four model specifications, for both the small and large firm sub-samples, the estimated coefficients on the Delaware dummy continue to be positive. While the estimated Delaware coefficients in the small firm regressions are greater in magnitude than that of the large firm regressions, there are statistically significant results associated with the large firms. The large firm results for the traditional model are mixed, however, for the three alternative models, there is unambiguous evidence that the domicile effect does impact large firms. Overall, there is no substantive evidence that domicile effects are limited to firms of a certain size.

4.5.4. Fluctuating Domicile Effects

Bebchuk, Cohen and Ferrell (2002) took issue with Daines' (2001) finding of a positive Delaware effect, in part, based on the fluctuations in the apparent size of the effect. They note that the estimated coefficient on the Delaware dummy fluctuates from one year to the next and is statistically significant in some years but not in others. They call these large fluctuations "deeply puzzling" since they do not correspond to changes in Delaware corporate law. As such, they argue that the unexplained fluctuations cast doubt on the conclusion that Delaware corporate law impacts firm value. Their argument

³⁰ Subramanian's results suggest that most of the effect is due to firms with net sales under \$50 million. As such, using the \$100 million cut-off is a more severe test of whether there exists a domicile effect in larger firms.

overlooks, or at least downplays, two important considerations. First, the Delaware dummy coefficients that are presented by Daines (2001), Subramanian (2004) and myself are simply estimates of the true coefficient, which are calculated based on a sample of firms. As estimates, we must expect fluctuations in repeated calculations based on different sets of sample observations. The presented coefficients will tend to vary within some range, depending on the standard error of the estimate (even the calculated standard error is itself an estimate of the true standard error). The very nature of the analytical process dictates that there will be fluctuations in the estimated effect.

Second, a change in corporate law is not necessary for there to be a change in the market's assessment of the merits of the law. Observed performance and changes in economic conditions cause certain firm strategies, organizational structures and governance characteristics to fall in and out of favor with market participants. Similarly, a statute that helps entrench firm management may be seen as benign or beneficial at one point in time, but may later be seen as harmful to shareholders interests. As such, there may be fluctuations in the domicile effects, even when there has been no substantive change in corporate law.

While the estimated domicile effects presented in this paper are, on the whole, relatively consistent. It is interesting to note the time period associated with the least consistent results and also the time period associated with the strongest results. The domicile effects appear to be less consistent in the 1998-2002 timeframe. This was a period in the market where investors were largely concerned with the growth potential of companies. There were also a large number of high-profile corporate takeovers and mergers. Many investors wanted firm management to focus on innovation and longer-

term strategies, even if it meant losses in the short to mid-term. During this period, corporate law that entrenched firm management may have been seen, at least by some investors, as beneficial since it allows management to focus on long-term strategies and may also help target companies obtain a higher price premium for their shareholders in a takeover. In 2001 and 2002, many corporate scandals came to light and a renewed interest in management accountability grew. Concerns about corporate governance and managerial entrenchment became more dominant considerations. This may be responsible for the stronger results seen in 2003 and 2004. Investors may have increased the valuation discount associated with jurisdictions that have corporate law that entrenches management and they may also have reassessed the value that they place on the non-statutory aspects of corporate law.

Delaware is the only state with a specialized court for resolving corporate disputes (Daines 2001) and, as such, the judges have much more experience dealing with matters of corporate law. Also, since Delaware is the legal domicile to such a large number of firms, there is a much more extensive body of relevant legal precedent. Given this, Delaware incorporation may lead to improved and more predictable resolution of corporate disputes (Romano 1985; Klausner 1995). In light of evidence of widespread corporate malfeasance, investors may now see Delaware incorporation as adding more value than was the prevailing view a few years ago. Admittedly, I present no evidence to support this conjecture about why the domicile valuation effects may have fluctuated. The preceding is only intended to illustrate that there are plausible explanations for fluctuating effects that are consistent with the effects being related to differences in state corporate law.

4.5.5. The Source of the Delaware Advantage

I have presented evidence that suggests that firms incorporated in Delaware are more valuable, on average, than firms domiciled in other states (at least some other states). This leads to the question: What is the source of the positive Delaware effect? The results from Models 2 and 3 suggest that at least a portion of the Delaware effect can be attributed to statutory differences between the states; there is a stronger Delaware effect when the comparison group of states is selected based on characteristics of statutory law. In Model 2, I compare Delaware firms to firms incorporated in high entrenchment states. In Model 3, I compare Delaware firms to firms incorporated in states with unusual and extreme antitakeover statutes.

In order to investigate whether statutory differences are the sole source of the positive Delaware effect, I run a series of regressions, in which I include a control variable that is an index of the corporate law of the firm's domicile state. The index used is the legal environment measure (LEM) developed by Ferris, Lawless and Noronha (2004). This index measures the presence and speed of adoption of certain corporate law statutes.³¹ Since the effect of corporate law may not be linear (with respect to the chosen legal index), three alternative control specifications are utilized. In the first specification, the control variable is simply the LEM variable. In the second specification, the control

³¹ Ferris, Lawless and Noronha describe the LEM as a measure of "pro-management" orientation of the state's corporate law. Since the statutes they examine deal with antitakeover statutes and statutes shielding management from civil liabilities, it can also be seen as a measure of managerial entrenchment.

variable is the logarithm of LEM. In the final specification, I use a quadratic model and control for LEM and the square of LEM.³²

The regression results are presented in Table 4.8. Although the statistical significance is low, in the first two specifications the expected negative relationship between statutory entrenchment (as measured by LEM) and firm value is reflected in the coefficient estimate. More importantly for the issue at hand, it can be seen that even after introducing a variable to specifically control for statutory differences in corporate law, the estimated coefficient on the Delaware dummy variable is consistently positive. Furthermore, it is statistically significant in the 1998-2004 pooled sample and is statistically significant in two of the four annual cross-sections (for the first two specifications). Overall, there is some evidence of a positive Delaware effect, even after controlling for statutory differences. As such, we cannot dismiss the possibility that a portion of the Delaware effect is driven by non-statutory factors, such as the organization and expertise of the judiciary and the body of Delaware case law.³³

4.6. Conclusions

Corporate law helps determine investor rights and managerial obligations and certainly has the potential to affect firm value. In the US, firms can choose to incorporate in any state regardless of the firm's physical location and each state has its own unique system of corporate law. The overall merit of this system has been the subject of much

³² In theory, we may expect that there would be an optimum value for LEM (optimal level of managerial entrenchment or optimal level of decision-making authority delegated from shareholders to managers) that would maximize shareholder value. Furthermore, this optimum could fall within the range of observed LEM scores, instead of at or beyond one end of the range (some states may provide too little entrenchment and some may provide too much). As such, the relationship between firm value and a corporate law index could be concave. This is the reason for including a quadratic specification.

³³ Admittedly, an alternative explanation for the results is that they are driven by an improperly specified procedure for controlling for statutory law differences.

debate, with scholars arguing about whether domicile choice affects firm value, how this may influence domicile preference and the resulting trajectory of US corporate law. In this paper, I focus primarily on the first issue, whether the incorporation domicile affects firm value. Using regression analysis and 15 years of US firm data, I analyze the relationship between legal domicile and firm value. The methodology used in this paper improves on previous research, primarily by avoiding the assumption that corporate law in the jurisdictions other than Delaware is homogeneous.

Overall, I find strong evidence that firm value is related to firm legal domicile. Consistent with the prior work of Daines (2001), I find evidence that Delaware domiciled firms are worth more, on average, than non-Delaware firms. However, this effect is not consistent across all non-Delaware jurisdictions; Delaware incorporation appears valuable relative to some states but not others, with valuation differences correlated to differences in statutory law. Specifically, corporate law that provides greater entrenchment of management is associated with reduced firm value. I also find some evidence consistent with domicile valuation impacts being driven, in part, by non-statutory factors. As such, Delaware's extensive body of case law, specialized court system and expert judiciary may also contribute to shareholder value.

The empirical results should be interpreted with care. That the most popular domicile, Delaware, appears to be associated with improved firm value has, in the past, been interpreted as supporting both the race to the top view and also the efficacy of the current US system of corporate law. Proponents of the current system should consider the fact that many firms choose to incorporate in what are, apparently, inferior legal domiciles (domiciles that entrench management with significant antitakeover legislation).

If, in fact, this represents sub-optimal domicile choice, the overall economic cost could be very large even if the majority of firms choose their legal domicile optimally. Furthermore, there is little evidence that states actively compete for corporate charters and we have no evidence regarding the trajectory of US corporate law (is it getting better or worse over time?). My analysis is restricted to answering whether a firm's domicile affects its value and I find evidence that it does. How this influences the domicile preferences of different types of firms and the long-term impact this will have on the overall quality of US corporate law remain open to interpretation, debate and further research.

References

- Baysinger, B.D., Butler, H.N., 1985. The role of corporate law in the theory of the firm. *Journal of Law and Economics* 28, 179–191.
- Bebchuk, L.A., Cohen, A., 2003. Firms' decisions where to incorporate. *Journal of Law and Economics* 46, 383-425.
- Bebchuk, L.A., Cohen, A., Farrell, A., 2002. Does the evidence favor state competition in corporate law? *University of California Law Review* 90, 1775-1821.
- Bertrand, M., Mullainathan, S., 2003. Enjoying the quiet life? corporate governance and managerial preferences. *Journal of Political Economy* 111, 1043-1075.
- Bhagat, S., Romano, R., 2001. Event studies and the law: part II – empirical studies of corporate law. *Yale ICF Working Paper No. 00-33*.
- Bhattacharya, U., Daouk, H., 2002. The world price of insider trading. *Journal of Finance* 57, 75-108.
- Black, B.S., 1990. Is corporate law trivial? - a political and economic analysis. *Northwestern University Law Review* 84, 542-597.
- Cary, W.L., 1974. Federalism and corporate law: reflections upon Delaware. *Yale Law Journal* 88, 663-707.
- Choi, D., Kamma, S., Weintrop, J., 1989. The Delaware courts, poison pills, and shareholder wealth. *Journal of Law, Economics and Organization* 5, 375–393.
- Daines, R., 2001. Does Delaware law improve firm value? *Journal of Financial Economics* 62, 525-558.
- Daines, R., 2001b. Do staggered boards affect firm value? Massachusetts and the market for corporate control. *NYU Law School Working Paper*, New York, NY.
- Daines, R., 2002. The incorporation choices of IPO firms. *New York University Law Review* 77, 1559-1610.
- Daines, R., Klausner, M., 2001. Do IPO charters maximize firm value? Antitakeover protection in IPOs. *Journal of Law, Economics and Organization* 17, 83-120.
- Dodd, P., Leftwich, R., 1980. The market for corporate charters: ‘unhealthy competition’ vs. federal regulation. *Journal of Business* 53, 259-283.
- Durnev, A., Kim, E.H., 2005. To steal or not to steal: firm attributes, legal environment, and valuation. *Journal of Finance* 60, 1461-1463.

- Dyck, A., Zingales, L., 2004. Private benefits of control: an international comparison. *Journal of Finance* 59, 537-600.
- Ferris, S.P., Lawless, R.M., Noronha, G., 2004. The influence of state legal environments on firm incorporation decisions and values. CORI Working Paper No. 2004-13, University of Missouri, Columbia, MO.
- Garavaglia, S., Sharma, A. 1998. A smart guide to dummy variables: four applications and a macro. Proceedings of the Northeast SAS Users Group Conference.
- Gompers, P., Ishii, J., Metrick, A., 2003. Corporate governance and equity prices. *Quarterly Journal of Economics* 118, 107-155.
- Grossman, S., Hart, O.D., 1982. Corporate financial structure and managerial incentives. In: McCall, J. (Ed.) , *The Economics of Information and Uncertainty*. University of Chicago Press, Chicago, IL, pp. 107–137.
- Heron, R.A., Lewellen, W.G., 1998. An empirical analysis of the reincorporation decision. *Journal of Financial and Quantitative Analysis* 33, 549-568.
- Himmelberg, C.P., Hubbard, R.G., and Love, I., 2004. Investor protection, ownership, and the cost of capital. World Bank Policy Research Working Paper No. 2834.
- Hyman, A., 1979. The Delaware controversy - the legal debate. *Journal of Corporate Law* 4, 368-398.
- Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76, 323-329.
- Kaplan, S., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics* 112, 167–215.
- Karpoff, J.M., Malatesta, P.H., 1989. The wealth effects of second-generation state takeover legislation. *Journal of Financial Economics* 25, 291-322.
- Karpoff, J.M., Malatesta, P.H., 1995. State takeover legislation and share values: the wealth effects of Pennsylvania's Act 36. *Journal of Corporate Finance* 1, 367-382.
- Klapper, L.F., Love, I., 2004. Corporate governance, investor protection, and performance in emerging markets. *Journal of Corporate Finance* 10, 703-723.
- Klausner, M., 1995. Corporations, corporate law and network of contracts. *Virginia Law Review* 81, 757-852.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2002. Investor protection and

- corporate valuation. *Journal of Finance* 57, 1147-1170.
- McConnell, J.J., Servaes, H., 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics* 27, 595-612.
- Morck, R., Shleifer, A., Vishny, R., 1988. Management ownership and market valuation: an empirical analysis. *Journal of Financial Economics* 20, 293-315.
- Morck R., Yang, F., 2002. The mysterious growing value of S&P 500 membership. NBER Working Paper No. 8654.
- Modigliani, F., Miller, M.H., 1963. Corporate income taxes and the cost of capital: a correction. *American Economic Review* 53, 433-443.
- Nenova, T., 2003. The value of corporate voting rights and control: a cross-country analysis. *Journal of Financial Economics* 68, 325-351.
- Netter, J., Poulsen, A., 1989. State corporation laws and shareholders: the recent experience. *Financial Management* 18, 29-40.
- Peterson, P., 1988. Reincorporation motives and shareholder wealth. *Financial Review* 23, 151-160.
- Romano, R., 1985. Law as a product: some pieces of the incorporation puzzle. *Journal of Law, Economics and Organization* 1, 225-283.
- Ryngaert, M., Netter, J.M., 1988. Shareholder wealth effects of the Ohio antitakeoverlaw. *Journal of Law, Economics and Organization* 4, 373-383.
- Shin, H., Stulz, R., 2000. Firm value, risk, and growth opportunities. NBER Working Paper No. 7808.
- Subramanian, G., 2004. The disappearing Delaware effect. *Journal of Law, Economics and Organization* 20, 32-59.
- Szewczyk, S., Tsetsekos, G., 1992. State intervention in the market for corporate control: the case of Pennsylvania Senate bill 1310. *Journal of Financial Economics* 31, 3-23.
- Winter, R.K., 1977. State law, shareholder protection and the theory of the corporation. *Journal of Legal Studies* 6, 251-292.
- Zingales, L., 1994. The value of the voting right: a study of the Milan Stock Exchange experience. *Review of Financial Studies* 7, 125-148.

Table 4.1.
Summary statistics for key variables

Variable	Tobin's Q	ROA	Net Sales (\$millions)	R&D/assets	Segments	LEM
Mean	3.16	-0.25	1717.36	0.13	1.96	15.40
Std. Deviation	24.09	16.71	9075.67	1.81	1.46	3.89
Minimum	0.21	-2353.33	0.00	-0.04	1	5.78
5 th Percentile	0.77	-0.75	1.61	0.00	1	8.06
10 th Percentile	0.90	-0.41	4.81	0.00	1	8.92
Median	1.69	0.06	99.93	0.05	1	16.66
90 th Percentile	5.16	0.23	2504.72	0.26	4	19.60
95 th Percentile	7.57	0.31	6773.95	0.40	5	20.00
Maximum	2992.00	24.20	263989.00	255.00	10	27.77

Based on 23,806 firm-year observations from 1990 to 2004, except for Segments and LEM (legal environment measure). Segments' statistics are based on 12,480 observations from 1998 to 2004 (segment data was not available prior to 1998). LEM statistics are firm weighted (weighted based on firm-year observations) based on 23,803 firm-year observations from 1990 to 2004 (LEM was not available for the District of Columbia). Net sales are inflation adjusted (using the US Consumer Price Index and 2004 as the base year).

Table 4.2.
Legal domicile state grouping by model

Model	Basis for grouping	Groups (dummy variables) [% of sample*]	Includes firms domiciled in	Comment
Traditional	Delaware	DE [56.2%] Non-DE ⁺ [43.9%]	Delaware Other States	A dummy variable is assigned based on whether the firm is incorporated in Delaware.
Model 1	Sample Adequacy	CA [5.3%] CO [1.2%] DE [56.2%] FL [2.0%] MA [3.0%] MN [3.9%] NV [2.2%] NJ [2.5%] NY [4.4%] PA [2.1%] TX [1.3%] Others ⁺ [15.9%]	California Colorado Delaware Florida Massachusetts Minnesota Nevada New Jersey New York Pennsylvania Texas Other States	A dummy variable is assigned to each state that is the legal domicile to at least 2% of the sample observations.
Model 2	Unique Reputation & Classification Based on Existing Statutes	DE [56.2%] MA [3.0%] NV [2.2%] OH [2.2%] PA [2.1%] Low [5.5%] High ⁺ [7.9%] Moderate [21.0 %]	Delaware Massachusetts Nevada Ohio Pennsylvania Low Entrenchment States High Entrenchment States Other States	A unique dummy variable is assigned to each state that is reputed to have a potentially unique body of corporate law. The remaining states are classified as having corporate law that confers on management a low, high or moderate level of entrenchment.
Model 3	Bad Reputation	DE [56.2%] Bad Reputation ⁺ [7.3%] Others [36.6%]	Delaware Mass, Ohio & Penn Other States	A unique dummy variable is assigned to Delaware incorporation. A second dummy variable represents incorporation in Massachusetts, Ohio or Pennsylvania (states with “extreme” statutes that are seen as potentially harmful to shareholders). The remaining states are grouped together.

The dummy variable is set equal to one if the firm is domiciled in that state (or group of states) in the observation year.

* The percentage of firms falling within each group is based on the 1990-2004 pooled sample. The percentages are representative of the distribution in the sub-periods or individual years.

+ Signifies that this is the omitted category (baseline group for comparison) in the regression model.

Table 4.3.
Traditional model

Independent Variable	Dependent variable: Tobin's Q											
	1990	1996	1998	1999	2000	2001	2002	2003	2004	1990-2004	1990-1997	1998-2004
Delaware incorporation	0.027 (0.017)	0.028** (0.013)	0.015 (0.015)	0.022* (0.013)	0.021 (0.013)	0.011 (0.012)	-0.002 (0.012)	0.032*** (0.011)	0.032** (0.013)	0.025*** (0.008)	0.027*** (0.010)	0.019** (0.009)
ROA	0.511*** (0.051)	0.382*** (0.039)	0.384*** (0.044)	0.274*** (0.035)	0.362*** (0.041)	0.205*** (0.036)	0.403*** (0.036)	0.416*** (0.034)	0.406*** (0.039)	0.383*** (0.012)	0.486*** (0.017)	0.332*** (0.016)
Lagged ROA	-0.014 (0.054)	-0.019 (0.039)	-0.048 (0.043)	-0.094** (0.037)	-0.105*** (0.037)	0.042 (0.031)	-0.127*** (0.036)	-0.256*** (0.035)	-0.119*** (0.041)	-0.064*** (0.011)	-0.004 (0.016)	-0.104*** (0.014)
Log(sales)	-0.084*** (0.017)	-0.068*** (0.010)	-0.06*** (0.010)	-0.058*** (0.007)	-0.046*** (0.008)	-0.045*** (0.008)	-0.047*** (0.009)	-0.055*** (0.006)	-0.072*** (0.007)	-0.076*** (0.004)	-0.074*** (0.008)	-0.066*** (0.004)
R&D/assets	0.603*** (0.110)	0.479*** (0.085)	0.129 (0.091)	0.056 (0.036)	0.382*** (0.054)	0.273*** (0.081)	0.25*** (0.041)	0.074* (0.039)	0.001 (0.002)	0.016 (0.014)	0.437*** (0.059)	0.010 (0.009)
Segments			-0.014** (0.007)	-0.02*** (0.005)	-0.015*** (0.005)	-0.021*** (0.004)	-0.014*** (0.004)	-0.017*** (0.004)	-0.018*** (0.004)			-0.019*** (0.003)
Observations	850	1,319	1,266	1,265	1,435	1,724	1,905	2,059	1,443	21,070	8,327	11,097
Adjusted R^2	0.305	0.327	0.250	0.320	0.267	0.220	0.178	0.268	0.275	0.236	0.335	0.225

Regressions estimate the association between Tobin's Q and Delaware incorporation. The pooled sample consists of 21,070 annual observations of 3,173 exchange-traded firms between 1990 and 2004. Coefficient estimates are presented with standard errors shown in parenthesis (standard errors for the annual regressions are robust to heteroskedasticity and for the pooled sample regressions they are robust to arbitrary serial correlation and time-varying variances in the disturbances). The dependent variable is an estimate of Tobin's Q ranked against all other firms for that year (quantile transformation). Similarly, ROA and lagged ROA are subject to quantile transformation prior to regression. Industry effects (based on two-digit primary SIC) are included in all regressions and year effects are included in the pooled sample regressions. Other control variables that are included but not shown include: locations dummies (a location state dummy is included for each state that contributes 5% or more of the observations); size dummies; and interactions between log(sales) and size dummies. Regressions were run using OLS with an intercept term included. Financial data is from Compustat (CD ROM dated 4/29/05). Historical incorporation and location data are from archived Compustat CD-ROMs. Firms traded on a major US exchange are included in the sample, except for: financial firms, utilities, foreign firms, firms with no sales, firms with dual-class common stock and firms with missing variable information. I have chosen not to present results for each individual year in the early portion of the sample period due to space limitations. The results presented for 1990, 1996 and for the pooled 1990-1997 period are representative of the omitted results. * Significant at 10%; ** Significant at 5%; *** Significant at 1%

Table 4.4.
Alternative models

Domicile Dummies	Dependent variable: Tobin's Q											
	1990	1996	1998	1999	2000	2001	2002	2003	2004	1990- 2004	1990- 1997	1998- 2004
Panel A – Model 1												
DE	0.031 (0.022)	0.043** (0.018)	0.017 (0.020)	0.044** (0.018)	0.029 (0.018)	0.017 (0.018)	0.011 (0.017)	0.061*** (0.016)	0.038** (0.018)	0.038*** (0.011)	0.039*** (0.013)	0.032** (0.013)
Adjusted R^2	0.314	0.329	0.256	0.323	0.267	0.221	0.179	0.278	0.277	0.240	0.339	0.230
Panel B – Model 2												
DE	0.074*** (0.029)	0.060** (0.025)	0.038 (0.027)	0.045* (0.026)	0.053* (0.028)	0.047** (0.024)	0.038 (0.024)	0.072*** (0.024)	0.066*** (0.025)	0.065*** (0.016)	0.062*** (0.018)	0.056*** (0.020)
MA	0.129* (0.072)	0.067 (0.052)	0.002 (0.060)	-0.052 (0.050)	-0.028 (0.052)	0.005 (0.050)	0.044 (0.049)	-0.042 (0.043)	-0.035 (0.043)	0.028 (0.034)	0.053 (0.047)	-0.006 (0.036)
NV	0.099 (0.089)	0.01 (0.049)	-0.059 (0.067)	0.05 (0.057)	0.054 (0.046)	0.002 (0.043)	0.044 (0.055)	0.133*** (0.039)	0.104** (0.045)	0.061** (0.030)	0.061 (0.043)	0.066** (0.032)
OH	0.023 (0.042)	0.016 (0.037)	-0.063 (0.051)	-0.09** (0.045)	-0.048 (0.049)	-0.055 (0.038)	-0.001 (0.039)	-0.044 (0.041)	-0.032 (0.042)	-0.011 (0.027)	0.011 (0.028)	-0.047 (0.033)
PA	0.045 (0.065)	0.099** (0.044)	0.07 (0.048)	0.052 (0.048)	0.04 (0.048)	0.056 (0.043)	0.038 (0.041)	0.051 (0.043)	0.036 (0.044)	0.054* (0.028)	0.047 (0.036)	0.052 (0.035)
Low	0.047 (0.055)	0.031 (0.040)	0.007 (0.044)	0.061 (0.040)	0.043 (0.041)	0.075** (0.037)	0.099** (0.039)	0.088** (0.035)	0.032 (0.039)	0.065** (0.026)	0.046 (0.033)	0.070** (0.029)
Moderate	0.058* (0.033)	0.037 (0.027)	0.055* (0.030)	0.035 (0.029)	0.053* (0.030)	0.051* (0.026)	0.035 (0.026)	0.044* (0.026)	0.058** (0.029)	0.051*** (0.018)	0.044** (0.020)	0.050** (0.021)
Adjusted R^2	0.305	0.327	0.253	0.324	0.268	0.223	0.179	0.275	0.278	0.238	0.336	0.229

Panel C – Model 3

DE	0.017 (0.031)	0.001 (0.024)	0.037 (0.030)	0.073*** (0.026)	0.064** (0.026)	0.041* (0.024)	0.005 (0.023)	0.078*** (0.022)	0.078*** (0.022)	0.040*** (0.015)	0.027 (0.020)	0.053*** (0.018)
Not DE, MA, OH or PA	-0.011 (0.033)	-0.033 (0.025)	0.027 (0.031)	0.06** (0.027)	0.051* (0.027)	0.035 (0.025)	0.008 (0.024)	0.055** (0.024)	0.057** (0.024)	0.019 (0.016)	0.000 (0.021)	0.041** (0.019)
Adjusted R^2	0.304	0.327	0.249	0.322	0.268	0.220	0.177	0.270	0.276	0.236	0.334	0.225
Observations	850	1,319	1,266	1,265	1,435	1,724	1,905	2,059	1,443	21,070	8,327	11,097

Regressions estimate the association between Tobin's Q and the incorporation domicile (relative to the omitted domicile category). In Model 1, dummy variables are also included for incorporation in each of CA, CO, FL, MA, MN, NV, NJ, NY, PA and TX (not shown); the omitted domicile category is all other states. In Model 2, the omitted domicile category is the group of states classified as having a body of corporate law reflecting "high entrenchment" of management. In Model 3, the omitted domicile category is the group of states with extreme antitakeover statutes that are generally viewed as bad for shareholders (these are MA, OH and PA). The pooled sample consists of 21,070 annual observations of 3,173 exchange-traded firms between 1990 and 2004. Coefficient estimates are presented with standard errors shown in parenthesis (standard errors for the annual regressions are robust to heteroskedasticity and for the pooled sample regressions they are robust to arbitrary serial correlation and time-varying variances in the disturbances). The dependent variable is an estimate of Tobin's Q ranked against all other firms for that year (quantile transformation). Industry effects (based on two-digit primary SIC) are included in all regressions and year effects are included in the pooled sample regressions. Other control variables that are included but not shown include: quantile transformations of ROA & lagged ROA; log(sales); R&D/assets; Segments (not included in regressions involving observations prior to 1998); locations dummies (a location state dummy is included for each state that contributes 5% or more of the observations); size dummies; and interactions between log(sales) and size dummies. Regressions were run using OLS with an intercept term included. Financial data is from Compustat (CD ROM dated 4/29/05). Historical incorporation and location data are from archived Compustat CD-ROMs. Firms traded on a major US exchange are included in the sample, except for: financial firms, utilities, foreign firms, firms with no sales; firms with dual-class common stock and firms with missing variable information. I have chosen not to present results for each individual year in the early portion of the sample period due to space limitations. The results presented for 1990, 1996 and for the pooled 1990-1997 period are representative of the omitted results.

* Significant at 10%

** Significant at 5%

*** Significant at 1%

Table 4.5.
Comparison of Delaware dummy variable coefficient to other domicile dummy variable coefficients

	Null Hypothesis	Alternative Hypothesis	<i>p</i> -value
Model 1:			
	DE ≥ CA	DE < CA	0.285
	DE ≥ CO	DE < CO	0.693
	DE ≥ FL	DE < FL	0.074
	DE ≥ MA	DE < MA	0.979
	DE ≥ MN	DE < MN	0.098
	DE ≥ NV	DE < NV	0.340
	DE ≥ NJ	DE < NJ	0.944
	DE ≥ NY	DE < NY	0.992
	DE ≥ PA	DE < PA	0.543
	DE ≥ TX	DE < TX	0.553
Model 2:			
	DE ≥ MA	DE < MA	0.978
	DE ≥ NV	DE < NV	0.343
	DE ≥ OH	DE < OH	0.999
	DE ≥ PA	DE < PA	0.547
	DE ≥ Low	DE < Low	0.263
	DE ≥ Moderate	DE < Moderate	0.687
Model 3:			
	DE ≥ Not DE, MA, OH or PA	DE < Not DE, MA, OH or PA	0.887

This table presents results of one-sided hypothesis tests comparing the Delaware dummy variable coefficients to the other domicile dummy variables' coefficients. The testing is intended to determine whether there exists evidence that any domicile state (or group of states) is superior to Delaware in terms of its effect on firm value. The results are based on the 1998-2004 pooled sample regressions (11,097 observations). The model specifications, control variables and data sources are as previously described in Tables 4.3 and 4.4. The test statistic is a t-statistic, with the one-sided p-value presented.

Table 4.6.
Regressions controlling for potential endogeneity caused by selection bias

Domicile Dummies	Dependent variable: Tobin's Q	
	Coefficient Estimate	Standard Error
Traditional Model:		
DE	0.027*	(0.014)
Model 1:		
DE	0.040**	(0.018)
Model 2:		
DE	0.060**	(0.024)
MA	-0.033	(0.051)
NV	0.127**	(0.056)
OH	-0.021	(0.039)
PA	0.049	(0.043)
Low	0.058	(0.046)
Moderate	0.053**	(0.027)
Model 3		
DE	0.058**	(0.023)
Not DE, MA, OH or PA	0.039	(0.025)

This table presents regression estimates of the association between Tobin's Q and the incorporation domicile (relative to the omitted domicile category). The sampling procedure controls for selection bias by including only those firm observations where the 10 year lagged domicile is the same as the current year domicile. As such, it is less likely that any association between firm value and legal domicile is caused by high (or low) value firms choosing a particular legal domicile. The sampling procedure results in a pooled sample of 3,429 annual observations for 939 firms between 2000 and 2004. Model specifications, control variables and data sources are as previously described in Tables 4.3 and 4.4.

* Significant at 10%

** Significant at 5%

*** Significant at 1%

Table 4.7.
Regressions for different firm size categories

Domicile Dummies	Dependent variable: Tobin's Q			
	Small firms (sales<100 million):		Large firms (sales≥100 million):	
	1998-2004	2004	1998-2004	2004
Traditional Model:				
DE	0.030** (0.014)	0.045** (0.022)	0.000 (0.008)	0.022* (0.012)
Model 1:				
DE	0.040* (0.023)	0.053 (0.036)	0.022* (0.012)	0.029* (0.017)
Model 2:				
DE	0.060* (0.034)	0.066 (0.048)	0.032* (0.017)	0.043** (0.021)
MA	-0.050 (0.055)	-0.061 (0.074)	0.005 (0.035)	-0.037 (0.048)
NV	0.063 (0.044)	0.095 (0.060)	0.062* (0.037)	0.071 (0.061)
OH	-0.010 (0.103)	-0.061 (0.151)	-0.031 (0.026)	0.011 (0.037)
PA	0.132** (0.055)	0.066 (0.095)	0.012 (0.029)	0.020 (0.039)
Low	0.040 (0.044)	0.006 (0.065)	0.100*** (0.026)	0.009 (0.037)
Moderate	0.038 (0.037)	0.027 (0.053)	0.038** (0.018)	0.044* (0.023)
Model 3				
DE	0.042 (0.035)	0.085* (0.050)	0.036** (0.015)	0.046** (0.022)
Not DE, MA, OH or PA	0.014 (0.037)	0.046 (0.052)	0.044*** (0.016)	0.029 (0.023)
Observations	5,351	650	5,746	793

This table presents regression estimates of the association between Tobin's Q and the incorporation domicile (relative to the omitted domicile category). Prior to running the regressions, the full sample is split into two sub-samples based on firm size. Coefficient estimates are presented with standard errors shown in parenthesis. Model specifications, control variables and data sources are as previously described in Tables 4.3 and 4.4. I have chosen not to present results for each individual year due to space limitations. The pooled results for the earlier period (1990-1997) and the results for individual years in the 1998-2003 time period also suggest that domicile valuation effects are not limited to firms of a certain size.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%

Table 4.8.
Regressions with an index of corporate law (LEM) as a control variable

Independent Variable	1998	2000	2002	2004	1998-2004
LEM Model:					
DE	0.020 (0.016)	0.025* (0.014)	0.007 (0.013)	0.035*** (0.013)	0.024** (0.010)
LEM	-0.001 (0.002)	-0.001 (0.002)	-0.003 (0.002)	-0.001 (0.002)	-0.002 (0.001)
Log(LEM) Model:					
DE	0.020 (0.017)	0.027* (0.015)	0.013 (0.014)	0.037*** (0.014)	0.027*** (0.010)
Log(LEM)	-0.020 (0.029)	-0.020 (0.027)	-0.052** (0.024)	-0.023 (0.025)	-0.031* (0.019)
Quadratic LEM Model:					
DE	0.025 (0.021)	0.028 (0.018)	0.024 (0.018)	0.046** (0.014)	0.035*** (0.013)
LEM	-0.006 (0.011)	-0.004 (0.010)	-0.017* (0.009)	-0.011 (0.009)	-0.011 (0.007)
(LEM) ²	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Observations	1,266	1,434	1,905	1,443	11,096

Regressions estimate the association between Tobin's Q and Delaware incorporation while controlling for statutory law in the firm's legal domicile using the LEM ('legal environment measure') index. The pooled sample consists of 11,096 annual observations of 2,329 exchange-traded firms between 1998 and 2004. Coefficient estimates are presented with standard errors shown in parenthesis (standard errors for the annual regressions are robust to heteroskedasticity and for the pooled sample regression they are robust to arbitrary serial correlation and time-varying variances in the disturbances). The dependent variable is an estimate of Tobin's Q ranked against all other firms for that year (quantile transformation). Industry effects (based on two-digit primary SIC) are included in all regressions and year effects are included in the pooled sample regression. Other control variables that are included but not shown include: quantile transformations of ROA & lagged ROA; log(sales); R&D/assets; segments; locations dummies (a location state dummy is included for each state that contributes 5% or more of the observations); size dummies; and interactions between log(sales) and size dummies. Financial data is from Compustat (CD ROM dated 4/29/05). Historical incorporation and location data are from archived Compustat CD-ROMs. Firms traded on a major US exchange are included in the sample, except for: financial firms, utilities, foreign firms, firms with no sales; firms with dual-class common stock and firms with missing variable information. I have chosen not to present results for each individual year due to space limitations. The results presented are representative of the results for 1999, 2001 and 2003.

* Significant at 10%
 ** Significant at 5%
 *** Significant at 1%

CHAPTER 5

GENERAL CONCLUSIONS

The objective of this dissertation is to assess how two aspects of public policy, personal tax policy and corporate law, impact corporate governance. The dissertation consists of three papers: the first paper is a theoretical analysis of the effect of personal taxation on managerial performance; the second paper empirically examines a hypothesized negative relationship between personal taxation and firm efficiency; and the third paper empirically examines the effect of state corporate law on corporate governance by assessing the relationship between firm legal domicile and firm value.

The analysis in the first paper suggests that firm agency costs will be positively related to personal-tax progressivity. It also establishes the potentially significant role that performance thresholds and compensation discontinuities may play in determining managerial responses to exogenous changes in the tax environment. With these discontinuities, it is possible for the equilibrium level of managerial performance to be highly sensitive to tax parameter changes. Finally, the paper indicates that the effect of a change in the level of taxation on managerial performance is indeterminate without making specific assumptions about the form of the manager's utility function.

The second paper examines a sample of US firms and variation in across-state personal-tax policy and finds evidence consistent with firm efficiency being negatively impacted by personal-tax progressivity. Although the results appear robust based on a variety of tests, due to sample limitations, an alternative explanation for the results based on potentially relevant omitted control factors cannot be dismissed. Together, papers one

and two suggest that personal-tax progressivity contributes to increased corporate agency costs and indicates a need for further empirical testing.

The third paper presents evidence that a firm's US legal domicile affects its value and that the valuation effect may be based on both the differences in the corporate law statutes that exist across jurisdictions and also on other factors, such as the body of case law, the organization of the courts and the expertise of the judiciary. Furthermore, there is evidence that beyond a certain level, within the range found in the US, corporate law that provides greater entrenchment of management is harmful to shareholder interests. The results are generally inconsistent with the "race to the bottom" theory of corporate law, since I find evidence that the most popular legal domicile (Delaware) has a body of corporate law that is as good or better than that of other states in terms of maximizing shareholder value. These findings have direct implications for investors, firm directors and public policy makers alike.