CONTEMPORARY ECONOMIC POLICY

DO TAX CUTS ENCOURAGE RENT SEEKING BY TOP CORPORATE EXECUTIVES? THEORY AND EVIDENCE

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This paper explores the role of tax policy in shaping incentives for executive effort (labor supply) and rent seeking within the firm. We develop a theoretical model that distinguishes between effort and rent-seeking responses to income taxes, and provides a framework to estimate a lower bound for the rent-seeking response. Using executive compensation and governance data, we find that rent seeking represents an important component of the response to changes in tax rates, especially among executives in firms with the worst corporate governance. (*JEL* D31, G30, H21)

I. INTRODUCTION

The soaring incomes of the so-called "1%" of income earners have ignited significant controversy in both public opinion and academic discourse. Lavish pay at the top, coupled with yawning federal budget deficits and shrinking public services, has generated growing public support for greater taxation on the rich. Opponents point out the "big tradeoff" between equality and efficiency.[1] Since economic growth and job creation after the recession have been tepid, a particularly pressing policy concern is the efficiency cost of taxing top income earners.

The extent that inequality has increased in the last decades is evidenced by the doubling of the share of the top 1% from less than 10% in the 1970s to over 20% in the late 2000s (Piketty and Saez 2003). The rise in top income shares is largely driven by income growth of executives (managers and supervisors) and financial professionals, which together account for 58% and 67% of income growth of the top 1% and 0.1%, respectively (Bakija, Cole, and Heim 2012). While increased executive pay might be consistent with efficient compensation schemes, several studies advance that corporate executive pay contracts, at least in recent decades, are inconsistent with principles of optimal contract design.[2] As a result, executives would be afforded compensation in excess of that necessary to optimally mitigate agency and incentive problems, thereby conferring economic rents from shareholders to executives. Because of the importance of executive compensation in economic efficiency and the rise of inequality, we focus on executive incomes to

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1. The "big tradeoff" alludes to Arthur Okun's prominent book *Equality and Efficiency: The Big Tradeoff.* Diamond (2016) provides a brief overview of several market and policy factors responsible for the rise of inequality in the United States.

2. That is, pay arrangements regularly fail to filter observable background noise in performance. Bebchuk (2004) shows that incentive pay fails to filter luck from performance despite quite tenable solutions (e.g., indexing equity to general market or industry conditions). Bertrand and Mullainathan (2001) reach the same conclusion, finding that pay for luck is as large as pay for performance. Finally, Bebchuk and Fried (2010) point out that boards fail to limit the unwinding of equity incentives through various financial instruments.

ABBREVIATIONS

E Index: Entrenchment Index
EAS: Equity-At-Stake
G Index: Governance Index
IRRC: Investor Responsibility Research Center
ISO: Incentive Stock Options
JMS: Jensen-Murphy Statistic
LTIP: Long-Term Incentive Payout
NQSO: Nonqualified Stock Options
PSS: Piketty, Saez, and Stantcheva
S&P: Standard and Poor's

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gain insight into the consequences of the potential cost of increasing top tax rates and reversing the rise of top incomes.

In both the United States and other English-speaking countries, there is a strong long-run correlation between tax cuts and top income shares (Frydman and Molloy 2011; Piketty, Saez, and Stantcheva 2014; Saez 2016). Early studies advanced that the subsequent rise in top incomes was the result of increases in labor supply (Feldstein 1995; Lindsey 1987). However, the empirical evidence does not accord with the standard supply-side explanation (Heckman 1993; Saez, Slemrod, and Giertz 2012). In view of this evidence, an alternative explanation for the relationship between tax cuts and top income shares might be greater rents afforded to top income earners.

Piketty, Saez, and Stantcheva (2014) (henceforth, "PSS") document suggestive empirical evidence that tax cuts might encourage rent seeking (increased "compensated bargaining") among top income earners. The primary piece of evidence is that tax cuts are associated with higher pretax income shares of the top 1%, both within the United States over time and across countries. But, tax cuts are not associated with greater economic growth as standard supply-side arguments would predict. PSS leverage these results to infer that the rent-seeking elasticity is (at least) 0.3, while the supply-side (effort) response is (at most) 0.2, implying that rent-seeking response represents at least 60% of the total response to changes in tax policy. PSS supplement the macro-based evidence with suggestive micro-based evidence documenting that the elasticity of pretax income with respect to top marginal income tax rates is inversely related to measures of corporate governance using cross-country variation in top tax rates, and that pay-for-luck was greater during low-tax periods.[3] PSS do not, however, leverage the micro-based evidence to estimate the rent-seeking response, and there are a number of concerns with the empirical evidence, such as endogeneity of tax rates across countries and the interpretation of the pay-for-luck findings.[4]

3. The former finding is based on cross-sectional CEO pay across countries (in 2006), whereas the later finding is based on time series CEO pay within the United States (1970–2010).

4. That is, the finding that pay-for-luck was lower in the 1970–1986 (high-tax) period than the 1978–2010 (low-tax) period might be explained by alternative factors, such as the dramatic increase in option-based pay between the two periods.

The contribution of the present paper is to develop a theoretical model that distinguishes between productive effort and rent-seeking responses, and provides a framework for estimating a lower bound of the rent-seeking elasticity. The primary insight is that the rent-seeking elasticity is strictly positive whenever the elasticity of income is decreasing in corporate governance. We leverage the theoretical model to generate a unique empirical approach to uncovering a lower bound of the rent-seeking response using variation in the elasticity of income across executives in firms with varying corporate governance, thereby overcoming endogeneity concerns associated with using aggregate country-level variables.

We employ a panel of executives with executive fixed effects, which exploits variation in top marginal tax rates over time for a single executive. The use of fixed effects overcomes the concerns with the micro-based evidence documented in PSS, which relies on cross-country variation in top marginal tax rates at a single point in time. We use executive compensation data for the top five paid executives in Standard and Poor's (S&P) 1,500 companies from the Execucomp database for the period 1992–2005. We follow a similar empirical strategy as Goolsbee (2000) and Frydman and Molloy (2011) to examine the elasticity of taxable income with respect to the net-of-tax rate. We decompose the elasticity of income across various measures of corporate governance, using a well-known index of corporate governance—the so-called E Index—proposed by Bebchuk, Cohen, and Ferrell (2008), among several other measures. Using the framework of the model, we find that rent seeking constitutes an important component of executives' response to changes in marginal tax rates. In particular, we find that the rent-seeking response represents at least 54% of the total response to changes in tax policy, which is quite similar to the lower bound derived by PSS using cross-country regressions.

While the literature generally finds that the elasticity of income with respect to marginal income tax rates is modest or even zero (Saez, Slemrod, and Giertz 2012), we find that the elasticity of income is actually quite large for executives in firms with the worst corporate governance, where rent seeking is most prevalent and a larger component of executive income. Consequently, an implication of our study is that the rent-seeking response to changes in tax policy is dissuaded, at least in part, by good corporate

governance. Conversely, tax policy can serve as a substitute to corporate governance (to an extent) in discouraging rent-seeking and in turn increasing efficiency.

II. MODEL

In this section, we advance a simple model of executive income given endogenous effort and rent seeking using a similar framework as PSS. In particular, executive income consists of income earned from productive effort y and rent seeking (or "compensated bargaining") b, while before-tax earnings are given by $z = y + b$. Utility is a function of disposable (after-tax) income $z - T(z)$, where $T(z)$ is taxes paid and $\tau = T'$ is the marginal tax rate, and the cost (disutility) of productive effort and rent seeking. That is,

$$u(y, b) = z - T(z) - c(y) - e(b) \tag{1}$$

where $c(y)$ and $e(b)$ are costs associated with effort and rent seeking, respectively. Both functions are assumed to be increasing and convex. To retain simplicity and tractability, we abstract from hidden compensation and tax avoidance.[5]

Executives choose y and b to maximize utility, implying the following first-order conditions:

$$(1 - \tau) = c'(y) \quad \text{and} \quad (1 - \tau) = e'(b). \tag{2}$$

Convex costs thus imply that effort and rent-seeking are increasing in the net-of-tax rate $(1 - \tau)$. That is,

$$dy/d(1 - \tau) = 1/c''(y) > 0 \quad \text{and} \quad db/d(1 - \tau) = 1/e''(b) > 0. \tag{3}$$

The elasticity of income with respect to the net-of-tax rate ε therefore consists of two components[6]

$$\varepsilon = \varepsilon^y + \varepsilon^b = (1 - \theta)\, e^y + \theta e^b \tag{4}$$

where θ is the share of income earned from rent seeking, e^y is the elasticity of productive effort with respect to the net-of-tax rate, and e^b is the elasticity of rent seeking with respect to the net-of-tax rate. Because earnings and marginal tax rates are observable, it is possible to ascertain the elasticity of income with respect to the net-of-tax rate ε. We are, however, interested in disentangling the effort elasticity component ε^y and the rent-seeking elasticity component ε^b.

A. Corporate Governance

While corporate governance is often broadly defined, we consider corporate governance as the set of institutions of the firm, which bear on the cost of rent seeking. We denote the "quality" of corporate governance as the scalar $g \in \left[\underline{g}, \overline{g}\right]$ and assume that the cost of rent seeking is increasing in corporate governance. Corporate governance would include, for example, institutions that entrench the executive and make it more costly or difficult to remove the executive as well as strengthen monitoring of executives (the former would be associated with lower quality corporate governance, whereas the latter would be associated with higher quality corporate governance).[7] We discuss empirical measurement of corporate governance in more detail in the subsequent section. For simplicity, we assume the following cost functions:

$$c(y) = [1/(1 + \beta)]y^{1+\beta} \quad \text{and} \quad e(b) = [A(g)/(1 + \alpha)]b^{1+\alpha} \tag{5}$$

where α and β are cost parameters, and A is an increasing function.

As expected, the share of income earned from rent-seeking is decreasing in corporate governance. That is,

$$\theta(g) = 1 \Big/ \left[1 + A(g)^{1/\alpha}(1 - \tau)^{\frac{1}{\beta} - \frac{1}{\alpha}}\right] \tag{6}$$

where $\theta' < 0$. The elasticity of income with respect to the net-of-tax rate is therefore

$$\varepsilon = (1 - \theta)/\beta + \theta/\alpha \tag{7}$$

where $\varepsilon^y = (1 - \theta)/\beta$ and $\varepsilon^b = \theta/\alpha$.

Because the share of income earned from productive effort (rent seeking) is increasing (decreasing) in corporate governance, the effort (rent-seeking) elasticity is increasing (decreasing) in corporate governance. That is,

$$d\varepsilon^y(g)/dg = -\theta'/\beta > 0 \quad \text{and} \quad d\varepsilon^b(g)/dg = \theta'/\alpha < 0. \tag{8}$$

5. In the subsequent section, we demonstrate that "Other Compensation," which is a form of hidden compensation, represents a relatively small share of income and is unresponsive to changes in tax policy. Kuhnen and Zwiebel (2008) analyze the role of hidden pay in executive compensation, which is beyond the scope of this paper.

6. The elasticity of income is defined as $\varepsilon \equiv d \ln z / d \ln(1 - \tau)$, and so on for other elasticities.

7. While some aspects of corporate governance are endogenous with respect to executive characteristics and decisions, there are also firm institutions that are not subject to executive decisions, such as corporate charters and bylaws, as well as state and federal laws.

Expression (8) implies the following result. Because governance has confounding effects on the elasticity of income, the role of governance in the elasticity is ambiguous (however, $\alpha \geq \beta \iff \varepsilon' \geq 0$).

RESULT 1. *The rent-seeking elasticity* $\varepsilon^b(g)$ *is bounded below as follows*:

$$(9) \qquad \varepsilon^b(g) \geq \varepsilon(g) - \varepsilon\left(g^*\right) \geq 0$$

where $g^* = argmax_{g' \geq g}\{\varepsilon(g) - \varepsilon(g')\}$. *Consequently, the rent-seeking elasticity lower bound is strictly positive whenever* $\exists g' > g$ *such that* $\varepsilon(g) > \varepsilon(g')$. *In this case, the fraction of the elasticity income with respect to the net-of-tax rate due to rent-seeking is bounded below as follows:*

$$(10) \quad s(g) = \varepsilon^b(g)/\varepsilon(g) \geq 1 - \varepsilon\left(g^*\right)/\varepsilon(g)$$

Proof. The rent-seeking elasticity lower bound is derived as follows:

$$(11) \quad \varepsilon^b(g) \geq \varepsilon^b(g) - \varepsilon^b\left(g^*\right) = \varepsilon(g) - \varepsilon\left(g^*\right) - \left(\varepsilon^y(g) - \varepsilon^y\left(g^*\right)\right) \geq \varepsilon(g) - \varepsilon\left(g^*\right)$$

which implies the result as the rent-seeking elasticity is non-negative. ■

COROLLARY 1. The rent-seeking elasticity lower bound is strictly positive whenever the elasticity of income is monotonically decreasing in corporate governance. Moreover, the argmax $g^* = \overline{g}$ implying that

$$(12) \qquad \varepsilon^b(g) \geq \varepsilon(g) - \varepsilon\left(\overline{g}\right) > 0 \quad \text{and} \quad s(g) \geq 1 - \varepsilon\left(\overline{g}\right)/\varepsilon(g) > 0.$$

Intuitively, because the productive-effort elasticity is greater among executives in firms with better corporate governance, that the overall elasticity of income is greater among executives in firms with worse corporate governance is evidence of a strictly positive rent-seeking response. In particular, the difference in the rent-seeking elasticity between an executive with worse and better corporate governance must be less than the difference in the elasticity of income, implying that rent-seeking elasticity is bounded below by the difference in the elasticity of income whenever that difference is non-negative.

While the rent-seeking elasticity is generally unobservable, Corollary 1 elucidates a sufficient condition for uncovering a rent-seeking response to changes in marginal tax rates that is empirically verifiable. Consequently, the empirical analysis in the subsequent section is aimed at assessing whether the elasticity of income is decreasing in corporate governance. Moreover, if indeed the case, then we can estimate a rent-seeking lower bound by comparing the elasticity of income with the elasticity of income among executives with the best corporate governance.

The model has been kept intentionally simple for clarity and to generate a straightforward empirical approach to uncovering a lower bound for the rent-seeking elasticity. That the productive-effort elasticity is increasing in governance, whereas the rent-seeking elasticity is decreasing in governance (Expression (8)), is a sufficient condition for Result 1 and Corollary 1. In turn, a sufficient, but not necessary, condition for expression (8) are the specific, and highly stylized, cost functions given in Equation (5). In particular, the constant-elasticity cost functions imply constant elasticity of productive effort and rent seeking with respect to the net-of-tax rate, while the cost-shifter parameter $A(g)$ implies that the share of income associated with productive effort is increasing in governance (conversely, the share associated with rent-seeking is decreasing in governance), thereby implying expression (8).

Because the cost functions (5) are sufficient, but not necessary conditions, Result 1 and Corollary 1 are consistent with a number of generalizations. For example, corporate governance might instead (or in addition to) shift the cost elasticity parameter $\alpha(g)$ such that $\alpha'(g) > 0$. Because corporate governance is associated with greater pay for performance (Bertrand and Mullainathan 2001), it is also plausible that corporate governance reduces the cost of productive effort (increasing the benefit of exerting effort is tantamount to reducing the cost).[8] That is, $c(y) = B(g)/(1-\beta)y^{1+\beta}$ where $B'(g) < 0$. In this case, for a given rent-seeking elasticity, the rent-seeking lower bound would be less than it would be otherwise, making it less likely to uncover a positive rent-seeking response.

8. That corporate governance reduces the cost of productive effort (or increases the benefit) is also indirectly supported by studies documenting that corporate governance is positively related to firm value (Gompers, Ishii, and Metrick 2003) and productivity (Bertrand and Mullainathan 2003), though the evidence of the role of corporate governance in firm value is mixed (Core, Guay, and Rusticus 2006).

III. EMPIRICAL ANALYSIS

A. Data Sources

Compensation of the five highest-paid employees for the S&P 1,500 corporations are provided by Execucomp database, spanning from 1992 to 2011. This is a panel data of executives including detailed components of compensation. Also, Compustat North America, which includes the Execucomp database, contains various firm-level financial variables.[9]

We employ firm-level corporate governance data compiled by the Investor Responsibility Research Center (IRRC) and provided by Riskmetrics. The IRRC Takeover Defense database has been used to construct several corporate governance indicators, the most well-known being the so-called Governance Index (henceforth, G Index) by Gompers, Ishii, and Metrick (2003) and the Entrenchment Index (henceforth, E Index) by Bebchuk, Cohen, and Ferrell (2008); the latter refined the former 24 provisions composing the G Index to six key indicators. We focus primarily, but not exclusively, on the E Index because, as discussed by the authors, several provisions are superfluous. As an alternative measure of governance, we also employ a measure of takeover protection constructed from 17 takeover laws by Cain, McKeon, and Solomon (2017). Finally, we use the TAXSIM Model to simulate maximum marginal tax rates across states and across time, accounting for the combined effect of federal and state taxes.[10]

B. Tax Policy and Accounting for Tax Rates

From 1993 to 2003, a number of federal tax acts increased, and then decreased, marginal tax rates, along with changes at the state level, which can be used to identify the elasticity of taxable income. We briefly recount the major changes in the federal tax code. The Omnibus Budget Reconciliation Act of 1993 raised the top marginal income tax rate (for married, joint filers with taxable income greater than $250,000) from 31% to 39.6%. The Economic Growth and Tax Relief Reconciliation Act of 2001 contained a number of tax provisions that were phased in over several years. Many of the tax reductions were designed to be enacted over the course of up to 9 years; however, the Jobs and Growth Tax Relief Reconciliation Act of 2003 accelerated the reductions for 2004 and 2006, which were retroactively enacted to apply to the 2003 tax year. On July 1, 2001 and January 1, 2002, the year 2000 income rates (28%, 31%, 36%, and 39.6%) were reduced by 0.5 percentage points, reducing each rate by 1 percentage point. More reductions were scheduled for the beginning of 2004 and 2006, reducing the top rate by an additional 2.6 percentage points and the next three rates by an additional 2 percentage points. The 2003 tax cut accelerated these reductions, thereby lowering the rates to 25%, 28%, 33%, and 35%, which were effective for the 2003 tax year. All of the reduced rates have been in effect until 2012.

One of the drawbacks of using the Execucomp database, rather than tax return data, is that we cannot observe all components of total taxable income, including capital gains income, income of the spouse, and tax deductions. We follow the conventional approach in calculating earned income, which assumes that all executives are married and file joint income tax returns, and have no household income outside the firm. While several, or even most, studies rely on variation in federal marginal tax rates (Frydman and Molloy 2011; Goolsbee 2000), we follow several more recent studies using variation in state tax rates, as well as federal rates (Eissa and Giertz 2006; Katuščák 2009), using the TAXSIM Model simulator. To circumvent the problem of endogenous tax rates for individuals around the tax bracket cutoffs, we follow previous studies (Eissa and Giertz 2006; Goolsbee 2000) that exclude executives with permanent income below the top-bracket, where permanent income is defined as the mean income in the sample.[11] In particular, we follow Eissa and Giertz (2006) and exclude executives who have permanent income less than $400,000 (in 2006 dollars).[12]

C. Executive Compensation and Firm Data

We focus on taxable income, which is comprised of the following components: salary, bonus, options exercised (Incentive Stock

9. See Goolsbee (2000) for a more detailed discussion of the data, which are used extensively.

10. Table 1 defines all of the variables used and provides their respective sources.

11. Of course, permanent income might also be endogenous and limiting the sample might bias the results. For consistency with the literature and to maintain the focus of the paper, we rely on Goolsbee (2000), who addresses these issues and finds that the results are insensitive to various cutoffs and tax rate definitions.

12. Eissa and Giertz (2006) claim to use the same cutoff (after adjusting for inflation) as Goolsbee (2000), using $376,000 in 2004$, which is roughly $399,000 in 2006$.

Options [ISOs] and Nonqualified Stock Options [NQSOs]), long-term incentive payouts (LTIP), and restricted stock grants. We also disaggregate taxable income and look at the effect of tax rates on salary and bonus and options exercised separately, as well as the effect on compensation including non-taxable income. In general, all forms of taxable income are taxed at the personal earned income tax rate, except for ISOs, which are taxed at the capital gains rate upon sale. ISOs, unlike NQSOs, are not deductible against corporate profits and have an annual cap of $100,000 per-executive and, therefore, represent roughly 5% of options exercised. As conventional, we assume all options exercised are NQSOs. (See Hall and Liebman 2000 for a detailed discussion of the taxation of executive compensation.) Following Frydman and Molloy (2011), we control for firm-specific variables including market value, sales, leverage, and market-to-book ratio. To properly account for firm-level data and tax rates, it is necessary to omit firms with fiscal years straddling more than 1 year (i.e., firms with fiscal years not ending in December), which excludes about 40% of the observations.[13]

In addition to the usual set of controls employed in estimating the elasticity of taxable income, we also account for firm-level corporate governance—both as a determinant of taxable income and as a determinant of the elasticity of taxable income (interactive effect). Toward this end, we include the so-called E Index proposed by Bebchuk, Cohen, and Ferrell (2008), which is a categorical variable ranging, in ascending (descending) order in which the institutions of the firm favor executives (shareholders), from 0 to 6 based on the number of takeover defense provisions in place.[14] The G Index, developed by Gompers, Ishii, and Metrick (2003), follows a similar methodology, using an additional 18 (thus, 24 in total) defense provisions, which are closely related to the provisions included in the E Index, but also including six state laws related to corporate governance.[15] The G Index and, more recently, the E Index have been extensively used and it has been empirically demonstrated that shareholder rights are positively related to higher firm value, higher profits, higher sales growth, and lower capital expenditures.

D. Summary Statistics

Starting in 2006, the reporting of several Execucomp variables changed significantly and, starting in 2007, the variables needed to create the G and E Indices were no longer collected. Thus, we use data spanning from 1992 to 2005 (the limitation is not particularly unfavorable because there were no major changes in the federal tax code after 2004).[16] Before imposing any qualifications, the data contain 71,912 executive-year observations. After eliminating executives with permanent income below $400,000, at firms with fiscal years not ending in December, at firms without E Index data, or missing state residency data (therefore, we cannot assign a marginal tax rate), the sample is reduced to 31,297. Executives are observed in the sample for 8 years on average, with a standard deviation of 3.7 years.

Table 2 reports summary statistics by E Index quartiles.[17] The average taxable income in the sample is $2.4 million and the median taxable income is $989,000, indicating that the distribution is highly skewed. The relationship between E Index and taxable income appears negative—the lowest E Index quartile has the highest average taxable income ($3.3 million), whereas the highest and second highest quartiles have the lowest average taxable income (approximately

13. The assumptions concerning ISOs and excluding firms with fiscal years not ending in December pertain to all studies cited here. Typically, firms have fiscal years not ending in December to avoid having accounting deadlines coincide with periods of high business activity (e.g., retail sales). As far as we know, no studies have attempted to assess or remedy this shortcoming.

14. The six provisions include (1) staggered boards (directors are elected in overlapping terms, rather than simultaneously), (2) limitation on shareholders' ability to amend corporate bylaws through majority voting, (3) limitation on shareholders' ability to amend the corporate charter, (4) supermajority shareholder vote to approve a merger, (5) golden parachute (severance agreement providing benefits to executive in event of firing or change of control), and (6) poison pill (shareholder right that renders the company unattractive to a potential acquirer).

15. Gompers, Ishii, and Metrick (2003), Appendix 1 for a description of all of the provisions.

16. The data necessary to create the G and E Indices are only available for the years 1993, 95, 98, 00, 02, 04, and 06. We use lagged variables in missing years, except for 1992 and 1997 we use 1993 and 1998 data, respectively. The results are robust to using only nonimputed values; however, the long-run elasticity of taxable income cannot be estimated without continuous years. This is further discussed in the robustness checks.

17. We use quartiles rather than indices because several indices have very few observations (less than 1% of observations have E Index equal to six). E Index quartiles correspond to E Indices 0–1 (7,712 observations), 2 (7,238 observations), 3 (8,957 observations), and 4–6 (7,390 observations).

$2 million).[18] Median taxable income, however, exhibits markedly less variation across E Index quartiles ($1.15 million is the maximum, whereas $0.90 is the minimum).

Table 2 also reports firm attributes by E Index quartiles. The relationship between the E Index and firm size is clearly negative—the average market value of the lowest E Index quartile is more than four times greater than the market value of the highest E Index quartile. The median values display less variation across quartiles, indicating that, similar to taxable income, the distribution of market value is highly skewed. The market-to-book ratio is also negatively related to a firm's E Index, indicating that firms with lower E Indices have greater growth potential than firms with higher E Indices.

E. Regression Analysis

The standard specification to estimate the elasticity of taxable income takes the form:

(13)
$$\ln\left(\text{Income}_{i,t}\right) = \alpha_i + \beta \ln\left(1 - \tau_{i,t}\right) + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

where i indexes executives and t indexes time. The variable α_i represents executive-firm fixed effects, $X_{i,t}$ represents firm-specific variables (market value, sales, leverage, and market-to-book ratio in the previous period) and time-specific variables (time trend or year dummies) and $\varepsilon_{i,t}$ represents a random component. The variable $(1\text{-}\tau_{i,t})$ represents the net-of-tax rate, where $\tau_{i,t}$ is the maximum combined federal and state marginal tax rate. The estimated coefficient β, therefore, represents the elasticity of taxable income. We add to the standard specification by controlling for firm-specific corporate governance (the E Index) and interacting corporate governance with the net-of-tax rate. That is, we estimate the following baseline specification

(14)
$$\ln\left(\text{Income}_{i,t}\right) = \alpha_i + \sum_{E_j \in \mathscr{E}} \beta_j \left(\ln\left(1 - \tau_{i,t}\right) \times I\left\{E_{i,t} \in E_j\right\}\right) + \sum_{E_j \in \mathscr{E}} \delta_j I\left\{E_{i,t} \in E_j\right\} + X'_{i,t}\Gamma + \varepsilon_{i,t}$$

where $I\{E_{i,t} \in E_j\}$ is an indicator variable equal to 1 if the executive belongs to a firm with an E Index belonging to the E_j quantile and 0 if otherwise.[19] Recall, the E Index is decreasing in corporate governance. The coefficient β_j, therefore, represents the elasticity of taxable income for an executive belonging to a firm with E Index quantile E_j. The baseline model uses E Index quartiles (identical to summary statistics).[20]

Regression Results. Table 3 reports the regression results for estimating the elasticity of various forms of compensation with respect to the net-of-tax rate. Specification (1) estimates the standard specification, without controlling for E Index quartiles. The estimated (short-run) elasticity of taxable income for the entire sample is 2.55, and is significant at the 1% significance level. Specification (2) indicates that the elasticity of income varies significantly across E Index quartiles—the elasticity of the lowest quartile is 1.53, whereas the elasticity of the highest quartile is 3.32.

The elasticity of other forms of compensation follow a similar pattern as taxable income, although varying in magnitude as expected. In particular, the dependent variable Total Pay, which includes taxable income and Other (nontaxable) compensation, is similar to the estimates for the elasticity of taxable income.[21] As expected, the elasticity of Salary and Bonus (Cash) compensation is relatively small compared to the elasticity of exercised stock options (Options), which is quite large. As mentioned, nonperformance-based compensation (including Salary and Bonus) in excess of $1 million cannot be deducted from corporate profits, thus marginal increases in compensation are typically incentive-based pay (predominantly options), reflecting their relative tax advantage.

As pointed out by Goolsbee (2000) and Hall and Liebman (2000), contemporaneous responses to the net-of-tax rate may represent income shifting rather than "permanent" responses. Using the contemporaneous and future net-of-tax rate is the standard approach to

18. While this relationship might seem unexpected, the observation is consistent with corporate governance increasing the benefit of productive effort as discussed in Section II.

19. We use dummy variables for E Index because there is no, a priori, reason the relationship should be linear, nor should we rule out a nonmonotonic relationship.

20. That is, $E_j \in \mathscr{E} \equiv \{\{0,1\}, 2, 3, \{4,5,6\}\}$.

21. That the elasticities of Income and Total Pay are similar implies that "Other Compensation," which is primarily nontaxable income, is unresponsive to changes in tax policy. Indeed, we also find that the elasticity of Other Compensation is zero and is unrelated to corporate governance (not reported).

TABLE 1
Variable Descriptions

Variable	Description
Total Pay	Salary + Bonus + Restricted Stock Grants + LTIP Payouts + Value of Options Exercised + All Other Compensation
Income	Total taxable income: Salary + Bonus + Restricted Stock Grants + LTIP Payouts + Value of Options Exercised
Cash	Salary + Bonus
Options	Value of options exercised
Other Compensation	Compensation not counted elsewhere and is predominantly nontaxable (Goolsbee 2000), including severance payments, signing bonuses, 401 K contributions, among others
JMS	Change in the value of the executive's portfolio of stocks and stock options from a $1,000 change in firm value. The value of the executive's portfolio is calculated by adding the number of shares owned and the number of (exercisable and unexercisable) unexercised, in-the-money options, the latter multiplied by 0.7 following Baker and Hall (2004) to convert options to share equivalents
EAS	Change in the value of the executive's portfolio of stocks and stock options from a 1% change in firm value (see above for calculation of portfolio value)
Market Value	Price-Annual Close × Outstanding Shares
Sales	Sales
Leverage	Total Liabilities/Assets
Market-to-book	Price-Annual Close / Book Value per share
Return on assets	Net Income before Extraordinary Items and Discontinued Operations / Total Assets
%Board ownership	Average number of shares owned by board directors as a percent of all shares outstanding
Ownership Conc.	Herfandal Index of institutional investor ownership concentration
E Index	Categorical index of firm "Entrenchment," ranging from 0 to 6, in descending order of shareholder rights (ascending order of executive power)
G Index	Categorical index of firm "Governance" constructed by Gompers, Ishii, and Metrick (2003), ranging from 0 to 24, in descending order of shareholder rights. See Section III.C for more details
Net-of-tax rate $(1-\tau)$	Maximum tax rate (total federal and state) for an additional $1,000 of income on an initial $1,500,000 of wage income. The taxpayer is assumed to be married and filing jointly. A mortgage interest deduction of $150,000 and the calculated state income tax are present as personal deductions
Tenure	Current Year – Year Joined Company
Fixed pay	Excess fixed compensation defined as the residual in the ordinary least squares regression using Cash as a dependent variable and the set of controls used in Berger, Ofek, and Yermack (1997)
Hidden pay	Options and restricted stock grants and Other Compensation
Forced turnover	Number of executives leaving company (age < 62)/Number of active executives
Board size	Number of board members
Blockholder	Dummy variable indicating presence of large institutional block holder (>5% shares)

allowing individuals to anticipate as well as react to tax changes.[22] If anticipation is important then the forward net-of-tax rate should be negatively related to current taxable income; that is, future tax increases should increase current taxable income. The sum of the short-run (contemporaneous) and the anticipation elasticity represents the long-run (or at least non-transitory) response to the net-of-tax rate. Certainly this is an important consideration to explore here—it may be that poor corporate governance (higher E Index) only affords greater discretion in the timing, rather than level, of the response to changes in the net-of-tax rate.

Specification (7) indicates that the anticipatory responses are remarkably similar for all quartiles; however, the contemporaneous elasticities remain larger for higher quartiles. The long-run elasticity of taxable income to changes in the net-of-tax rate for all executives is approximately 0.5 (specification 6), which is within the range of estimates in the literature, and ranges between 0.04 for executives with the lowest E Index and 0.8 for executives with the highest E Index.[23] While the average elasticity is relatively low and in fact almost negligible for executives in firms with good corporate governance, it is quite large for executives in firms with the worst corporate governance. A Wald-type test rejects the null

22. Using the forward net-of-tax rate is problematic for a number of reasons; however, we follow the conventional approach because remedying these problems is beyond the scope of this paper. The primary objective is not necessarily to determine precise long-run estimates, but to show that the differences in the short-run elasticities (which are measured more precisely) are not merely a reflection of differences in timing.

23. Consistent with Goolsbee (2000) and Frydman and Molloy (2011) (among others), we find significant short-run responses to taxes, but modest long-run responses. Goolsbee (2000), for example, finds that the short-run elasticity "exceeds one," whereas the "elasticity after one year is at most 0.4 and probably closer to zero."

TABLE 2
Summary Statistics by E Index Quartiles (1992–2005): mean (top row) and median (bottom row) values

E Index Quartile	All	1	2	3	4
Number of observations	31,297	7,712	7,238	8,957	7,390
Executive compensation					
Total pay (x1,000)	2,938	3,984	2,973	2,411	2,453
	1,217	1,428	1,238	1,129	1,153
Income (x1000)	2,442	3,342	2,456	1,991	2,034
	989	1,151	1,015	903	950
Cash (x1,000)	1,050	1,278	1,051	929	957
	722	829	735	673	693
Options exercised (x1,000)	1,365	2,054	1,394	1,026	1,027
	96	111	102	90	88
Other compensation (x1,000)	169	208	165	145	160
	32	32	30	32	35
Hidden pay (/total pay)	0.44	0.46	0.47	0.47	0.48
Fixed pay (error term)	0.10	0.07	.011	0.15	0.09
Executive wealth sensitivity					
JMS	9.58	12.17	9.78	7.80	8.90
	2.35	2.13	2.43	2.30	2.48
EAS	0.203	0.257	0.207	0.165	0.188
	0.051	0.047	0.053	0.051	0.054
Firm financials					
Market value (x1 million)	13,823	28,721	12,694	8,145	6,269
	3,750	5,626	3,710	3,619	2,966
Market-to-book	3.17	3.65	3.39	2.87	2.80
	2.40	2.55	2.57	2.38	2.22
Leverage	0.63	0.62	0.61	0.61	0.66
	0.63	0.63	0.61	0.62	0.66
Return on assets	4.35	3.87	4.27	4.84	4.35
	4.10	3.66	4.51	4.26	3.89
Firm governance					
% Board ownership	0.72	1.06	0.81	0.51	0.57
Hostile Index	0.18	0.17	0.18	0.20	0.20
Ownership concentration	0.057	0.071	0.055	0.052	0.049
Forced turnover	0.12	0.11	0.12	0.12	0.11
Board size	10.40	10.27	10.10	10.90	10.52
Blockholder	0.76	0.72	0.77	0.77	0.82
Tenure	8.15	7.64	8.13	8.74	8.74
Governance (G Index)	9.57	6.88	8.78	10.55	11.96

Note: See Table 1 for a description of variables. Sample includes executives with permanent income greater than $400,000 in 2006 USD. All prices deflated by the Consumer Price Index in 2006$.

hypothesis that the long-run elasticities among each pair of quartiles are equal. These results are even more pronounced when we employ the federal, rather than state-specific, net-of-tax rates, which are reported in specification (8).[24]

Estimating the Rent-Seeking Elasticity. Recall Corollary 1 indicates that the rent-seeking elasticity is strictly positive whenever the elasticity of income is monotonically decreasing in corporate governance. Because corporate governance is decreasing in the E Index, the elasticity of income is monotonically decreasing in corporate governance in all specifications. In particular, using specification (2), a Wald-type test rejects the null hypothesis that the elasticities among each pair of quartiles are equal at the 1% significance levels. Moreover, pairwise testing that the various elasticities are equal are rejected at conventional significance levels.[25] That the elasticity of the first quartile is equal to the elasticity of fourth

24. Using federal tax rates entails losing fewer variables and overcomes possible endogeneity resulting in executives moving across state borders.

25. The hypothesis that the elasticity of first (lowest) quartile is equal to the elasticity of the second quartile is rejected with p value = .05; that the elasticity of third quartile is equal to the elasticity of the fourth quartile is rejected with p value = .06; that the elasticity of the first quartile is equal to the elasticity of third quartile is rejected with p value = .03; and that the elasticity of the second quartile is equal to the elasticity of fourth quartile with p value = .04.

TABLE 3
Elasticity of Various Forms of Compensation with Respect to the Net-of-Tax Rate

Variables	(1) Income	(2) Income	(3) Total Pay	(4) Cash	(5) Options	(6) Income	(7) Income	(8) Income
$(1-\tau_t)$	2.550***					3.235***		
	(0.262)					(0.329)		
$(1-\tau_{t+1})$						−2.727***		
						(0.343)		
$(1-\tau_t)\times I\{E\in E_1\}$		1.525***	1.724***	0.195	3.954***		2.904***	2.815***
		(0.407)	(0.371)	(0.268)	(1.022)		(0.495)	(0.493)
$(1-\tau_t)\times I\{E\in E_2\}$		2.373***	2.547***	0.775***	6.428***		3.212***	3.095
		(0.381)	(0.348)	(0.251)	(0.957)		(0.463)	(0.468)
$(1-\tau_t)\times I\{E\in E_3\}$		2.514***	2.849***	0.950***	7.993***		3.325***	3.624***
		(0.351)	(0.320)	(0.231)	(0.875)		(0.430)	(0.424)
$(1-\tau_t)\times I\{E\in E_4\}$		3.316***	3.614***	1.363***	7.169***		3.661***	4.003***
		(0.376)	(0.343)	(0.248)	(0.940)		(0.457)	(0.444)
$(1-\tau_{t+1})\times I\{E\in E_1\}$							−2.865***	−3.082***
							(0.347)	(0.315)
$(1-\tau_{t+1})\times I\{E\in E_2\}$							−2.854***	−3.076***
							(0.347)	(0.315)
$(1-\tau_{t+1})\times I\{E\in E_3\}$							−2.861***	−3.076***
							(0.348)	(0.315)
$(1-\tau_{t+1})\times I\{E\in E_4\}$							−2.853***	−3.072***
							(0.348)	(0.315)
$I\{E\in E_2\}$		−3.378*	−3.268**	−2.295**	−9.909**		−1.209	−1.104
		(1.760)	(1.607)	(1.160)	(4.423)		(2.071)	(2.414)
$I\{E\in E_3\}$		−3.897**	−4.426***	−3.007**	−16.05***		−1.593	−3.177
		(1.822)	(1.663)	(1.201)	(4.563)		(2.149)	(2.307)
$I\{E\in E_4\}$		−7.073***	−7.470***	−4.692***	−12.59***		−2.875	−4.672*
		(1.947)	(1.776)	(1.284)	(4.878)		(2.289)	(2.381)
Market value	0.398***	0.399***	0.329***	0.0737***	0.751***	0.343***	0.355***	0.343***
	(0.014)	(0.014)	(0.013)	(0.009)	(0.035)	(0.016)	(0.016)	(0.014)
+Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Federal tax rates	No	No	No	No	No	No	No	Yes
Observations	26,727	26,727	26,736	26,713	25,999	20,896	20,559	26,044
Number of of executives	6,063	6,063	6,063	6,063	5,993	5,365	5,302	7,004
R^2	.208	.209	.251	.131	.149	.195	.197	.120

Notes: The sample in each regression pertains to 1992–2005, prices in 2006 constant dollars. All estimations control for executive-firm fixed effects and a linear time trend. Income represents total taxable income and includes: salary + bonus + restricted stock grants + LTIP payouts + value of options exercised. Total pay includes income + other compensation (nontaxable). Cash represents salary + bonus. Options refers to the value of options exercised. All specifications control for the combined federal and state net-of-tax rate, except specification (8) uses only federal rates. $I\{E\in E_j\}$ is an indicator variable equal to 1 if the executive-firm's E Index belongs to the j quartile and 0 if otherwise. +Firm controls includes: sales, Market-to-book value, and leverage in the previous year. All nonratio-scale variables, including all forms of compensation, the net-of-tax rate, market value, and sales, are in log form. Sample includes executives with permanent income greater than $400,000 in 2006 USD. Standard errors in parentheses.

*$p < .1$, **$p < .05$, ***$p < .01$.

quartile is strongly rejected at all conventional significance levels (p value = .0002).

Table 4 reports the lower bound for the share of the elasticity of income associated with rent-seeking as derived in Corollary 1 for various forms of compensation (specifications 2–5 in Table 3).[26] Recall that the lower bound of the rent-seeking elasticity among executives in firms with the best corporate governance is zero by definition. For taxable income, the results indicate that the share of the elasticity associated with rent-seeking is at least 54% (significant at the 1% significance level) among executives in firms with the worst corporate governance, decreasing to at least 39% and 36% among executives in firms with the second and third worst corporate governance, respectively (significant at the 5% and 10% significance levels). The lower bound of the rent-seeking elasticity for other types of compensation and the corresponding standard errors are also reported in Table 4.

26. The standard errors of the transformed coefficients are calculated using the delta method.

F. Alternative Measures of Corporate Governance

This section investigates alternative measures of corporate governance to corroborate the results in the previous section.

First, to address endogeneity concerns, we reestimate the primary specifications of Table 3 using Takeover Index quartiles. The Takeover

TABLE 4
Lower Bound for Rent-Seeking Elasticity Share

Variables	(1) Income	(2) Total Pay	(3) Cash	(4) Options
$s(E_2)$	0.357*	0.323*	0.748**	0.385**
	(0.200)	(0.173)	(0.355)	(0.183)
$s(E_3)$	0.393**	0.395***	0.795***	0.505***
	(0.183)	(0.145)	(0.286)	(0.139)
$s(E_4)$	0.540***	0.523***	0.857***	0.448***
	(0.133)	(0.112)	(0.198)	(0.160)

Notes: The coefficients for specifications (1)–(4) are calculated from Table 3 specifications (2)–(5). Following Corollary 1, the coefficients are calculated as 1 less the ratio of the elasticity of income to the elasticity of income for the first quartile E Index. Standard errors are calculated using the delta method and are in parenthesis.

*$p < .1$, **$p < .05$, ***$p < .01$

Index represents the probability of a hostile takeover and ranges from 0.01% to 0.63%. Table 2 reports that the overall mean value is 0.18%, where the mean value is slightly increasing in the E Index (Cain, McKeon, and Solomon 2017 find a similar relationship).

Table 5 reports the elasticity of various forms of compensation with respect to the net-of-tax rate according to Takeover Index quartiles, where $I\{H \in H_j\}$ is an indicator variable equal to 1 if the executive belongs to a firm with a Takeover Index within the j^{th} quartile of the distribution. Because corporate governance is positively related to the Takeover Index, Table 5 demonstrates that the elasticity of various forms of compensation with respect to the net-of-tax rate is inversely related to corporate governance, which is consistent with the baseline results.

Second, based on the observation that firms with better corporate governance are better at aligning firm and managerial incentives (Bertrand and Mullainathan 2001), we employ executive pay-for-performance measures as proxies for corporate governance. As pointed out by Jensen and Murphy (1990), there are many mechanisms through which pay-for-performance can be achieved; however, the primary mechanisms are ownership of stock and stock options. Following Baker and Hall (2004), we calculate the (equivalent) shares owned from the number of shares and unexercised stock options held by the executive. We refer to the change in executive wealth from all stocks and unexercised stock options held from a $1,000 change in firm value as the Jensen-Murphy statistic (JMS). Similarly, we refer to the change in executive's wealth from all stocks and unexercised stock options held from a 1% change in firm value as equity-at-stake (EAS).[27] Table 2 summarizes the JMS and EAS by E Index quartile. For all E Index quartiles, the value of stocks and stock options increases by $9.58 on average whenever the value of the firm increases by $1,000, whereas the median value increases by $2.35. Similarly, the average EAS is $0.20 and the median is $0.05. The median summary statistics for the JMS and EAS by E Index quartiles indicate that there appears to be little relationship between wealth sensitivity and E Index quartiles, and certainly variation within quartiles is more important than variation between quartiles, which suggests that the two testable hypothesis are more or less independent.

We also employ a wide range of proxies of corporate governance, including characteristics of the board of directors and institutional ownership, as well as various characteristics of firms and executives.[28] In particular, we use board equity ownership (average shares owned by board directors as percent of all shares outstanding) and board size, and ownership concentration of institutional block holders (Herfindahl-Hirschman Index) and a dummy variable indicating the presence of large institutional block holders (ownership >5% of shares). We also use executive excess fixed compensation, defined following Berger, Ofek, and Yermack (1997) as the residual term in the ordinary least

27. Whether the JMS or EAS is more important for value-adding incentives depends on whether the marginal product of effort is constant across firm size or increasing with firm size, thus we include both (the former (latter) implies the JMS (EAS) is more important).

28. The set of proxies are widely used in various strands of literature, including Berger, Ofek, and Yermack (1997), Bertrand and Mullainathan (2001), Yermack (1996), among many others.

TABLE 5
Elasticity of Various Forms of Compensation with Respect to the Net-of-Tax Rate

	(1) Income	(2) Total Pay	(3) Cash	(4) Options	(5) Income
$(1-\tau_t)\times I\{H\in H_1\}$	2.780***	2.563***	0.623***	6.126***	3.242***
	(0.497)	(0.476)	(0.196)	(0.817)	(0.446)
$(1-\tau_t)\times I\{H\in H_2\}$	1.913***	1.519***	0.497**	4.726***	2.013***
	(0.435)	(0.417)	(0.215)	(0.895)	(0.472)
$(1-\tau_t)\times I\{H\in H_3\}$	1.190***	1.004**	0.338	4.194***	1.716***
	(0.423)	(0.406)	(0.209)	(1.305)	(0.504)
$(1-\tau_t)\times I\{H\in H_4\}$	1.078**	0.898**	0.223	3.979***	1.567***
	(0.459)	(0.440)	(0.227)	(0.933)	(0.481)
$(1-\tau_{t+1})\times I\{H\in H_1\}$					−1.483**
					(0.633)
$(1-\tau_{t+1})\times I\{H\in H_2\}$					−1.519**
					(0.632)
$(1-\tau_{t+1})\times I\{H\in H_3\}$					−1.582**
					(0.631)
$(1-\tau_{t+1})\times I\{H\in H_4\}$					−1.584**
					(0.630)
$I\{H\in H_2\}$	−0.620	−0.597	−2.316**	7.001	0.520
	(2.300)	(2.205)	(1.136)	(7.097)	(2.434)
$I\{H\in H_3\}$	−5.061**	−5.075**	1.377	−13.864*	−6.355**
	(2.402)	(2.302)	(1.186)	(7.411)	(2.553)
$I\{H\in H_4\}$	−3.795	−2.933	0.856	−5.238	−1.385
	(2.523)	(2.417)	(1.246)	(7.782)	(2.662)
+Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	21,769	21,769	21,769	21,769	17,696
Number of executives	4,205	4,205	4,205	4,205	3,741
R^2	.303	.314	.139	.160	.313

Notes: The sample in each regression pertains to 1992–2005, prices in 2006 constant dollars. All estimations control for executive-firm fixed effects and a linear time trend. Income represents total taxable income and includes: salary + bonus + restricted stock grants + LTIP payouts + value of options exercised. Total pay includes Income + other compensation (nontaxable). Cash represents salary + bonus. Options refer to the value of options exercised. All specifications control for the combined federal and state net-of-tax rate, except specification (8) uses only federal rates. Other compensation includes nontaxable compensation (perks). $I\{H\in H_j\}$ is an indicator variable equal to 1 if the firm's Hostile Index belongs to the *j* quartile and 0 if otherwise. +Firm controls includes: sales, market-to-book value, and leverage in the previous year. All nonratio-scale variables, including all forms of compensation, the net-of-tax rate, market value, and sales, are in log form. Sample includes executives with permanent income greater than $400,000 in 2006 USD. Standard errors in parentheses.

*$p < .1$, **$p < .05$, ***$p < .01$

squares regression using cash pay (salary + bonus) as the dependent variable and the set of covariates used in Berger, Ofek, and Yermack (1997), and executive hidden compensation, defined following Kuhnen and Zwiebel (2008) as the sum of options granted, restricted stock grants, and other compensation. Finally, we use executive tenure and forced turnover, defined as the percentages of nonretiring (less than 62 years old) executives leaving the company in the previous year. Table 2 reports summary statistics for the various proxies of corporate governance.

Similar to Equation (14), we estimate the elasticity of taxable income allowing the elasticity of income, as well as the level of income, to depend on corporate governance proxies described above. Because the elasticity of income might be nonmonotonically related to proxies of corporate governance, we use quartile dummies in the case that the proxy is a continuous variable. For notation, we denote quartile dummies using $I\{Q \in Q_j\}$ equal to 1 if the governance variable for the executive is within the j^{th} quartile of the distribution.

Table 6 reports coefficient estimates for the elasticity of income with respect to the net-of-tax rate using taxable income (Income) in all specifications. With a few exceptions, all of the specifications corroborate that the elasticity of income is decreasing in corporate governance. Specifications (1) and (2) of Panel A indicate that performance pay is inversely related to the elasticity of taxable income. Specification (3) indicates that board ownership is inversely related to the elasticity of taxable income. Specification (4) indicates that ownership concentration is inversely

TABLE 6

Elasticity of Taxable Income with Respect to the Net-of-Tax Rate (Dep Var.: Income)

Panel A:

	Jensen-Murphy[a] (1)	EAS[a] (2)	%Board Ownership[a] (3)	Ownership Concentration[a] (4)	Blockholder[a] (5)
$(1-\tau_t)\times I\{Q \in Q_1\}$	2.603***	2.703***	3.592***	2.070***	1.809***
	(0.355)	(0.357)	(0.428)	(0.285)	(0.255)
$(1-\tau_t)\times I\{Q \in Q_2\}$	1.950***	2.041***	2.035***	1.434**	2.629***
	(0.310)	(0.311)	(0.427)	(0.274)	(0.246)
$(1-\tau_t)\times I\{Q \in Q_3\}$	1.415***	1.440***	0.997**	0.734**	
	(0.301)	(0.300)	(0.440)	(0.304)	
$(1-\tau_t)\times I\{Q \in Q_4\}$	0.134	0.216	1.013	1.572***	
	(0.323)	(0.320)	(0.494)	(0.368)	
Observations	34,876	34,875	20,893	33,982	30,474
Number of executives	8,195	8,195	8,451	7,358	5,054
R^2	.183	.183	.148	.199	.325

Panel B:

	Fixed Pay[b]	Hidden Pay[b]	Tenure[b]	Forced Turnover[a]	Board Size[b]
	(1)	(2)	(3)	(4)	(5)
$(1-\tau_t)\times I\{Q \in Q_1\}$	1.613***	1.385***	1.506***	2.479***	1.699***
	(0.371)	(0.317)	(0.391)	(0.368)	(0.393)
$(1-\tau_t)\times I\{Q \in Q_2\}$	2.301***	2.282***	2.181***	2.811***	2.010***
	(0.363)	(0.323)	(0.320)	(0.397)	(0.346)
$(1-\tau_t)\times I\{Q \in Q_3\}$	1.875***	2.829***	2.349***	2.292***	2.873***
	(0.368)	(0.343)	(0.273)	(0.359)	(0.365)
$(1-\tau_t)\times I\{Q \in Q_4\}$	1.424***	2.850***	1.559***	1.852***	2.579***
	(0.362)	(0.384)	(0.331)	(0.358)	(0.361)
Observations	31,589	26,422	31,589	31,589	27,200
Number of executives	5,245	4,827	5,245	5,245	4,238
R^2	.323	.310	.330	.323	.335

Notes: The sample in each regression pertains to 1992–2005, prices in 2006 constant dollars. All estimations control for executive-firm fixed effects and a linear time trend. The dependent variable is total taxable income, which includes: salary + bonus + restricted stock grants + LTIP payouts + value of options exercised. $I\{Q \in Q_j\}$ is an indicator variable equal to 1 if the index is in the j quartile of the distribution and 0 otherwise. The Jensen-Murphy Index is the change in executive wealth from all stocks and unexercised stock options held from a $1,000 change in firm value. The EAS Index is the change in executive wealth from a change of 1% change in firm value. %Board Ownership is the average percent of shares owned by the board of directors. Ownership concentration refers to the Herfandal Index of institutional investor ownership concentration. Sample includes executives with permanent income greater than $400,000 in 2006 US$. Standard errors in parentheses.

[a]The measure of corporate governance is increasing in corporate governance.

[b]The measure of corporate governance is decreasing in corporate governance.

*$p < .1$, **$p < .05$, ***$p < .01$

related to the elasticity of taxable income, though the relationship is not monotonic, while specification (5) indicates that the presence of a large institutional owner reduces the elasticity of taxable income.

Specification (1) of Panel B indicates that excess fixed compensation is inversely related to the elasticity of income, though the relationship is not monotonic. One explanation for this inconsistent result is that executives in firms with poor corporate governance might receive less cash compensation (salary and bonus) and greater hidden compensation (Kuhnen and Zwiebel 2008). Consistent with this hypothesis, specification (2) indicates that hidden compensation is positively related to the elasticity of income. Specification (3) indicates that the elasticity of income is increasing in executive tenure, though it decreases among executives with the greatest tenure. Specification (4) indicates that the elasticity of income is decreasing in forced turnover, while specification (5) indicates that the elasticity of income is increasing in board size, though the relationships are not strictly monotonic.

In sum, with a few exceptions, the results are generally consistent with previous findings—that the elasticity of income is inversely related to corporate governance.

TABLE 7

Elasticity of Taxable Income with Respect to the Net-of-Tax Rate Using Various E Index Quantiles and the G Index

Variables	(1) 2-Groups	(2) 3-Groups	(3) 5-Groups	(4) 6-Groups	(5) G Quartiles	(6) G Index
$(1-\tau_t)\times I\{E\in E_1\}$	2.070***	2.052***	1.528***	0.543		
	(0.326)	(0.326)	(0.407)	(0.583)		
$(1-\tau_t)\times I\{E\in E_2\}$	2.877***	2.496***	2.367***	1.854***		
	(0.295)	(0.350)	(0.381)	(0.450)		
$(1-\tau_t)\times I\{E\in E_3\}$		3.298***	2.469***	2.421***		
		(0.376)	(0.350)	(0.381)		
$(1-\tau_t)\times I\{E\in E_4\}$			2.573***	2.506***		
			(0.404)	(0.351)		
$(1-\tau_t)\times I\{E\in E_5\}$			6.552***	2.610***		
			(0.720)	(0.405)		
$(1-\tau_t)\times I\{E\in E_6\}$				6.582***		
				(0.720)		
$(1-\tau_t)\times I\{G\in G_1\}$					1.547***	
					(0.377)	
$(1-\tau_t)\times I\{G\in G_2\}$					2.405***	
					(0.340)	
$(1-\tau_t)\times I\{G\in G_3\}$					2.049***	
					(0.344)	
$(1-\tau_t)\times I\{G\in G_4\}$					3.603***	
					(0.399)	
$(1-\tau_t)$						−0.452
						(0.633)
$(1-\tau_t)\times$(G Index)						0.294***
						(0.0610)
G Index						−1.181***
						(0.246)
+Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26,727	26,727	26,727	26,727	29,167	29,167
Number of executives	6,063	6,063	6,063	6,063	6,560	6,560
R^2	.208	.208	.210	.210	.200	.200

Notes: The sample in each regression pertains to 1992–2005, prices in 2006 constant dollars. All estimations control for executive-firm fixed effects and a linear time trend. The dependent variable is taxable income, which includes: salary + bonus + restricted stock grants + LTIP payouts + value of options exercised. $I\{E\in E_j\}$ is an indicator variable equal to 1 if the executive-firm's E Index belongs to j quantile and 0 if otherwise. 2-Groups represents E Index medians, 3-Groups represents E Index terciles, and so forth. Similarly, $I\{G\in G_j\}$ is an indicator variable equal to 1 if the executive-firm's G Index belongs to the j quartile. G Index uses the index as a continuous-type variable. +Firm controls includes: market value, sales, market-to-book ratio, and leverage. All nonratio-scale variables, including all forms of compensation, the net-of-tax rate, market value, and sales, are in log form. Sample includes executives with permanent income greater than $400,000 in 2006 USD. Standard errors in parentheses.

*$p < .1$, **$p < .05$, ***$p < .01$

G. Robustness Checks

Next, we demonstrate that the results are robust with respect to particular modeling assumptions using various variations to the baseline model. First, we show that the results are not sensitive to using various quantile groups, besides the four quartiles used in the baseline model.[29] Table 7 demonstrates that the elasticity of taxable income is monotonically increasing in E Indices using various quantile groups. That is, variation within quartiles are consistent with variation between quartiles. Specification (4) indicates that, using six quantiles, the income of the lowest sextile does not exhibit an elasticity significantly different from zero, whereas the income of the highest sextile exhibits a markedly elastic response.

Second, we show that the results are consistent using the G Index. We employ the G Index using both quartiles (specification (5)) and as a continuous index (specification (6)). Similar to the baseline model, the estimates for the second and third quartiles are not statistically

29. The partitions were chosen to form the most balanced blocks that are collectively exhaustive and mutually exclusive. 2-Groups represents the partition {{0, 1, 2}, {3, 4, 5, 6}}, 3-Groups represents {{0, 1, 2}, 3, {4, 5, 6}}, 5-Groups represents {{0, 1}, 2, 3, 4, {5, 6}}, and 6-Groups represents {0, 1, 2, 3, 4, {5, 6}}. We do not use the 7 groups because less than 1% of the sample has E Index equal to six.

TABLE 8

Elasticity of Taxable Income with Respect to the Net-of-Tax Rate Robustness Checks (Dep Var.: Income)

	(1) +Trend^2	(2) Year Dummies	(3) Restricted Sample[a]	(4) Restricted Sample[b]	(5) Goolsbee Controls[c]	(6) All Firm Controls
$(1-\tau_t)\times I\{E\in E_1\}$	0.946**	1.835	1.153	1.470***	1.695***	1.853***
	(0.468)	(1.579)	(0.710)	(0.411)	(0.406)	(0.397)
$(1-\tau_t)\times I\{E\in E_2\}$	1.787***	2.617*	2.973***	2.350***	2.555***	2.828***
	(0.447)	(1.578)	(0.656)	(0.385)	(0.381)	(0.373)
$(1-\tau_t)\times I\{E\in E_3\}$	1.919***	2.802*	3.101***	2.462***	2.650***	2.870***
	(0.423)	(1.564)	(0.603)	(0.354)	(0.350)	(0.342)
$(1-\tau_t)\times I\{E\in E_4\}$	2.720***	3.584**	4.465***	3.353***	3.561***	3.393***
	(0.445)	(1.570)	(0.647)	(0.380)	(0.391)	(0.368)
Market value	0.397***	0.382***	0.471***	0.405***	0.300***	0.397***
	(0.0137)	(0.0141)	(0.0256)	(0.0140)	(0.0118)	(0.0149)
Return on assets					0.0028***	0.0035***
					(0.0006)	(0.0009)
Return on equity						−2.35e-05
						(0.0002)
Linear trend	Yes	n.a.	Yes	Yes	Yes	Yes
Quadratic trend	Yes	n.a.	No	No	No	No
Year dummies	No	Yes	No	No	No	No
+Firm controls	Yes	Yes	Yes	Yes	No	Yes
Observations	26,727	26,727	11,904	24,935	26,810	26,276
Number of executives	6,063	5,063	5,486	5,834	6,066	5,992
R^2	.209	.219	.226	.206	.203	.216

Notes: The sample in each regression pertains to 1992–2005, prices in 2006 constant dollars. All estimations control for executive-firm fixed effects and a linear time trend. The dependent variable is total taxable income, which includes: Salary + bonus + restricted stock grants + LTIP payouts + value of options exercised. Specification (6) controls for the baseline firm controls, the Goolsbee controls, and return on equity. +Firm controls includes: market value, sales, market-to-book ratio, and leverage. All nonratio-scale variables, including all forms of compensation, the net-of-tax rate, market value, and sales, are in log form. Sample includes executives with permanent income greater than $400,000 in 2006 USD. Standard errors in parentheses.

[a]Specification 3 employs only the actual (nonimputed) E Index data.

[b]Specification 4 restricts the sample to executives with at least four observation years.

[c]Goolsbee Controls refers to identical firm controls employed in Goolsbee (2000), which includes return on assets and market value.

*$p < .1$, **$p < .05$, ***$p < .01$

different from each other, but we can reject that the elasticity of the first and fourth quartiles are equal at all conventional significance levels (p value = .000). Specification (6) indicates that a one point increase in the G Index corresponds to an increase in the elasticity of income by approximately 0.3 (similarly a one standard deviation increase in the G Index corresponds to an increase in the elasticity by approximately 0.8). Or equally, the elasticity of income for an executive with a G Index one standard deviation above (below) the mean is 3.05 (1.47).

Table 8 performs a number of further robustness checks. Specification (1) uses a quadratic polynomial time trend.[30] Specification (2) controls for year fixed effects, which eliminates all variation in federal tax rates and is, therefore, typically not employed in related studies.[31] Nevertheless, the results still show consistent variation across E Index quartiles. Specification (3) uses only nonimputed E Indices and specification (4) uses only executives with four or more years of data.[32] Specification (5) uses a similar set of firm controls as Goolsbee (2000), which includes return on assets and market value. Specification (6) uses the baseline model firm controls, the Goolsbee (2000) firm controls, and return on equity. We also allow for

30. The results are robust using a cubic polynomial as well (not reported).

31. All other studies use a linear time trend and do not control for year fixed effects, except where it is possible to identify variation in the tax rate within years (e.g., comparing the top tax bracket with the second highest tax bracket). But that is not possible here because almost all samples are in the top bracket.

32. Excluding executives with limited years of data possibly introduces a survivorship bias as opposed to an attrition bias.

TABLE 9
Robustness Check: Clustering Analysis

Cluster Level	(1) -	(2) Executive	(3) Firm × Year	(4) Firm	(5) Industry × Year	(6) Industry
$(1-\tau_t)\times I\{E\in E_1\}$	1.525***	1.525***	1.525***	1.525**	1.525**	1.525*
	(0.407)	(0.484)	(0.517)	(0.617)	(0.656)	(0.883)
$(1-\tau_t)\times I\{E\in E_2\}$	2.373***	2.373***	2.373***	2.373***	2.373***	2.373***
	(0.381)	(0.414)	(0.449)	(0.541)	(0.543)	(0.548)
$(1-\tau_t)\times I\{E\in E_3\}$	2.514***	2.514***	2.514***	2.514***	2.514***	2.514***
	(0.351)	(0.340)	(0.351)	(0.437)	(0.380)	(0.412)
$(1-\tau_t)\times I\{E\in E_4\}$	3.316***	3.316***	3.316***	3.316***	3.316***	3.316***
	(0.376)	(0.394)	(0.424)	(0.501)	(0.478)	(0.529)

Notes: All specifications are identical to Table 3 column 2 (see table notes for more details). The Cluster Level indicates that the estimations use cluster-robust standard errors that are clustered on the corresponding group. For reference, specification (1) replicates Table 3 column 2. Cluster-robust standard errors in parentheses.
*$p < .1$, **$p < .05$, ***$p < .01$

the slopes of the firm-specific control variables to depend on E Index quartiles by interacting all of the firm-specific controls with E Index quartile dummies (not reported).[33] All of the results presented in Table (8) corroborate that the elasticity of taxable income is positively related to the internal institutions of the firm.

Clustered Standard Errors. Because the regression model errors might be correlated within firms or industries, the standard errors might be underestimated, thereby overstating the precision of the estimates. To assess the robustness of statistical inference, the baseline regression model is re-estimated using cluster-robust standard errors that cluster on various levels. In particular, we cluster the standard errors at the following levels: (i) executive, (ii) firm by year, (iii) firm, (iv) industry by year, and (v) industry. Clustering at the executive level would account for correlation of the error term within executives (over time), but would not account for correlation of the error term across executives within the firm. Clustering at the firm level would account for correlation across executives within the firm as well as correlation within executives, whereas clustering at the industry level would account for correlation across executives within industries (as well as within firms). We also employ two-way clustering to account for correlation across executives within firms for specific years and across executives within industries for specific years.

Using the baseline empirical model in Table 3 column 2, Table 9 reports the coefficients and cluster-robust standard errors for the elasticity of income with respect to the net-of-tax rate (recall clustering does not bear on the coefficient estimates). As expected, employing cluster-robust standard errors increases the standard errors, with the standard errors increasing in the size of the cluster group. All of the coefficient estimates remain statistically significant at conventional significance levels, even after clustering at the industry level.

33. Estimating separate models for each E Index quartile is, however, not robust due to the significant loss in degrees of freedom.

IV. CONCLUSION

This paper develops a theoretical model that distinguishes between the productive effort and rent-seeking responses to changes in marginal income tax rates. The model generates a lower bound of the rent-seeking elasticity, and derives an empirically-verifiable sufficient condition such that the rent-seeking elasticity is strictly positive—that the elasticity of income is decreasing in corporate governance. We use data on corporate executive compensation and a wide-range of proxies for corporate governance and find that the elasticity of income with respect to the net-of-tax rate is monotonically decreasing in corporate governance. We find that rent-seeking represents an important component of the response to changes in tax rates, and leverage the theoretical model to estimate a lower bound of the fraction of the elasticity of income due to rent-seeking, which ranges between 36% and 54% for taxable income.

While the empirical results suggest that rent-seeking represents an important response to changes in tax rates, we emphasize that the evidence is indirect in nature and the

conclusions are thus circumstantial in nature. To gain further insight, future studies should investigate the actual behavioral responses to changes in tax policy, not just the response of income, or explore further indirect testing. Another indirect test might entail investigating the performance of firms corresponding to changes in tax policy.

Given the high levels of public debt in advanced nations and growing public support for higher taxation on the rich, or at least curtailing the rise in after-tax income inequality, it is likely that many countries, including the United States, will significantly raise top income tax rates. However, as pointed out by Hall and Liebman (2000), executives manage assets worth billions of dollars and the incentives that the executives face, which are shaped by tax policy, are of substantial importance to economic performance as well as government revenue. Understanding whether tax policy influences rent seeking is, therefore, crucial to understand the efficiency costs associated with reducing income inequality and public debt.

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