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Can High Personal Tax Rates Encourage Entrepreneurial Activity?

ROGER H. GORDON*

When the top personal tax rates are above the corporate rate, high income individuals have an incentive to reclassify their earnings as corporate rather than personal income for tax purposes. At least U.S. tax law imposes strict limits on the extent to which employees in publicly traded corporations can engage in such income shifting. However, entrepreneurs setting up new firms can easily reclassify their income for tax purposes. This tax incentive therefore favors entrepreneurial activity. In the United States, these tax incentives were huge during the 1950s and 1960s, though they have been much smaller since then. [JEL H25, O31, L11]

ENTREPRENEURIAL ACTIVITY is commonly viewed to be a key ingredient generating economic growth. New firms try out not only new products and technologies, but also new internal forms of organization or even merely a new location. When new approaches succeed, other firms can imitate these new approaches, leading to general improvements in productivity.[1] The "new growth" literature suggests that spillovers of information such as from entrepreneurial activity play an important role in explaining economic growth. Given such spillovers, market incentives alone generate too little entrepreneurial activity.[2]

To what degree has tax policy affected the amount of entrepreneurial activity? Certainly, high tax rates discourage market activity generally. But

* Roger Gordon is Reuben Kempf Professor of Economics, University of Michigan. This paper was written while the author was visiting the IMF's Fiscal Affairs Department. He very much thanks the IMF for its support of this research.

[1] Similarly, when new approaches fail, other firms will know not to make the same mistakes.

[2] While patents help strengthen the incentives to try new technologies, patents cover only a fraction of the economic innovations that occur. Even in these cases, the resulting incentives understate the social return to an innovation, given the benefits to consumers from the innovation.

low tax rates alone are not plausibly the main factor affecting the amount of entrepreneurial activity, since they should lead to a comparable expansion in all types of activities rather than affecting entrepreneurial activity in particular. The fact that countries and time periods with high growth rates often had quite high tax rates also suggests the importance of other factors.[3] In this paper, I explore the hypothesis that the *relative* tax rates on different types of activities can have important effects on an individual's choice whether to become an entrepreneur. In particular, the paper explores the hypothesis that the difference between the corporate and top personal tax rates is a key factor affecting the incentive to explore new ideas or new products by opening a new firm.

The basic intuition is as follows: when the corporate tax rate is low relative to an individual's personal tax rate, this individual has an incentive to reclassify earnings as corporate rather than personal income for tax purposes. Entrepreneurs find this easy to do, since they merely have to incorporate and retain their earnings within the firm, generating taxable corporate income instead of wage and salary income.[4] To some extent, other corporate employees can also convert labor income into corporate income for tax purposes, as occurs in large U.S. corporations when executives receive compensation in the form of qualified stock options. Income shifting is much harder for these other employees than for entrepreneurs, however, because of explicit limitations in at least the U.S. tax law, and also because of higher nontax costs.[5] Section I explores a variety of factors that limit the extent of income shifting when the corporate tax rate is below the top personal tax rate and examines the degree to which these factors create an incentive to become an entrepreneur in order to exploit more easily the potential tax savings from shifting income from the personal to the corporate tax base.

The relative size of the corporate versus personal tax rate is only one factor affecting the incentive to set up a new firm. There are certainly a variety of nontax considerations involved (e.g., having a viable idea for a new firm) but other tax considerations may also be important. For example, new firms are inherently risky, and the treatment of tax losses and the shape of the tax schedule more generally can affect the attractiveness of undertaking risky

[3] In the United States, for example, the 1950s and 1960s were a period of particularly high growth rates, yet top personal tax rates during this period were as high as 87 percent.

[4] This income shifting may or may not generate taxable capital gains income at some point in the future. Under the U.S. personal tax code, capital gains are exempt if they remain unrealized at death, and a number of other countries exempt all capital gains from tax. See, for example, Holland (1969) for an earlier discussion of the gain from setting up a new firm to convert ordinary income into capital gains.

[5] For example, other employees must take into account the possibility that the firm is offering them equity as compensation in part because the equity is overvalued.

investments. In addition, new firms normally need outside financing, but outside investors at best have limited information about the financial prospects of new firms. While investors can acquire information at a cost, their incentive to do so depends on the tax treatment of the resulting income and in particular on the capital gains tax rate relative to the personal tax rate. Section I also examines the implications of some of these other tax considerations.

Tax incentives that favor new firms can benefit all new firms, however, and not only those new firms that try out new types of economic activities. Many new firms enter simply to imitate the successful activities already undertaken by an earlier entrepreneur, to gain part of the resulting profits. On efficiency grounds, there are too many such "copycat" firms, since much of their return comes at the expense of past entrepreneurs. In fact, taxes that encourage entry of "copycat" firms *discourage* individuals from becoming entrepreneurs by lowering their anticipated share of the resulting profits. An additional complication is that when taxes favor new firms, existing firms have an incentive to reorganize their activities in order to take advantage of these tax incentives, for example, by leasing their equipment from a new firm rather than buying it directly, or simply by changing their form of organization to take advantage of tax rate differences. Such new firms will be referred to as "tax shelters." These tax shelters may not impose any externalities on existing firms, but their behavior is still affected by tax rate differences. Throughout the discussion, this paper will consider how existing tax systems affect not only the amount of entrepreneurial activity, but also the amount of "copycat" and "tax shelter" activity. As will be seen, some tax provisions favor one type of activity over another, a result with important implications for tax policy.

Given the many conflicting effects of taxes that favor new firms, it is valuable to think more carefully about how to assess the efficiency implications of these tax distortions. The initial presumption would be that any change in behavior resulting from differential tax rates generates an efficiency loss. There are various reasons to question this presumption, however. To begin with, externalities generated by both entrepreneurs and copycat firms need to be taken into account. The above stories suggest in addition a variety of other market failures, due, for example, to information asymmetries between entrepreneurs and outside investors, creating credit constraints on new firms and limiting risk diversification. The implications of these market failures for tax policy are explored in Section II.

Section III then suggests possible empirical tests of the forecasts contained in the paper, while Section IV examines the implications of the results more broadly for tax policy. Existing income tax systems have nor-

[6] This pattern of tax rates of course does not always prevail. An exception, for example, would be the U.S. rate structure between 1987 and 1992.

mally had a corporate tax rate that is low relative to top personal tax rates, even after taking account of possible personal taxes on corporate income.[6] The resulting tax distortions favoring the entry of new firms are a normal feature of existing income tax systems.[7] Value-added taxes and proposed flat taxes, in contrast, do not generate such distortions. The degree to which these distortions generate efficiency gains through the encouragement of entrepreneurial activity is then a relevant consideration when considering the shift to a flat rate structure.

I. Implications of Corporate Versus Personal Tax Rates

Most studies of corporate taxes presume that the corporate tax base simply consists of the return to capital invested in the corporate sector. Observed corporate profit rates seem far too high to be consistent with this story, however. Feldstein and Summers (1977), for example, estimate that U.S. corporate income averaged 10.6 percent of the corporate capital stock during 1948–76, yet the average real treasury bill rate in the United States during the same time period was only 0.3 percent. Are there ways to reconcile these sharply different rates of return if corporate profits simply reflect the normal return to corporate capital? One possible story might be that corporate capital faces a higher relative tax rate, leading to a higher pretax rate of return to capital in equilibrium. This story is hard to reconcile with the evidence in Gordon and Slemrod (1988), however, which shows that corporate tax payments would go *up,* not down, if the corporate tax exempted the return to capital by shifting to a cash flow measure of income—treasury bills, in contrast, are taxed in full on their nominal return. Another explanation might simply be that the return to corporate capital is much riskier than the return to investments in bonds, and so it requires a higher expected return in equilibrium to compensate. Yet the evidence in Feldstein and Summers suggests that not only is the average corporate rate of return above the real interest rate during the sample period, but even the minimum corporate return (6.4 percent in 1974) is above the maximum real interest rate (2.5 percent in 1964). If the observed corporate return is simply the return to corporate capital, the return to capital stochastically dominates the return to bonds, which is inconsistent with both being held by investors.

The hypothesis motivating the discussion in this paper is that the high observed corporate profit rate results from entrepreneurs and highly paid corporate executives choosing to receive at least part of their compensation

[7] The relative effects on entrepreneurial activity versus copycat firms and tax shelters will depend on more detailed aspects of the tax code, however.

in a form taxed at the corporate rather than the personal tax rate. When an individual receives compensation in the form of qualified stock options, for example, the corporation receives no deduction for this payment and the individual receives no taxable income until the shares obtained through the option are ultimately sold, and then the income is taxed as a long-term capital gain.[8] Therefore, to the extent that qualified stock options are used instead of wage payments, reported corporate taxable income is higher[9] and the personal income reported by individuals in top tax brackets is lower, creating an overestimate of the rate of return to corporate capital and an underestimate of the income levels of top executives.

Use of qualified stock options is the principal means available to an employee of a publicly traded firm in the United States to convert income taxable under the personal tax into income taxable under the corporate tax.[10] U.S. law, however, currently limits the use of qualified stock options to $100,000 a year per employee.

For U.S. firms that are not publicly traded, however, there are no such limits in practice on the amount of income shifting that is possible. For example, in a firm entirely owned by employees of the firm, the issue is simply how much of their wage and salary compensation to retain within the firm, thereby generating capital gains rather than wage and salary income for these employees.[11] Retaining earnings instead of paying wages increases taxable corporate income and reduces taxable personal income. If no capital gains taxes are owed in the future when the shares are sold, then the tax incentive to retain earnings rather than pay wages depends simply on the difference between the corporate and personal tax rates.[12] Given that the limits in the United States on income shifting are not effective for privately held firms, the tax distortions favoring income shifting discourage firms

[8] Under U.S. law, if the shares are held until death as the evidence in Bhatia (1970) suggests is the norm, then the capital gains are never taxed under the personal tax. For a detailed examination of the tax implications of wage compensation versus compensation through qualified stock options, see the Appendix.

[9] Until recently, corporate accounting income would also be higher. Owing to Statement of Financial Accounting Standards (SFAS) 123, however, U.S. firms must now report a deduction when they pay executives using qualified stock options.

[10] There are also, of course, mechanisms for receiving compensation in a form deductible under the corporate tax yet not taxable under the personal income tax (e.g., "fringe benefits"), and also for receiving deferred compensation.

[11] When the firm has outside owners, the employees can instead be paid in the form of shares of equity in the firm. Under U.S. tax law, they would be taxed (and the firm would receive a deduction) equal to the "fair market" value of these shares. In practice, this would likely be approximated by the book value, which can be very small compared with the market value, particularly in new firms where the value depends almost entirely on future prospects.

[12] An explicit calculation of the tax incentives is found in the Appendix.

from going public. When the book value of equity is trivial, the tax law even discourages outside ownership, which provides the tax authorities independent information about the value of the firm's shares.

To give a sense of the strength of these tax incentives to convert personal income into corporate income, Table 1 provides time series information for the United States on these tax incentives. Column 1 reports the top personal tax rate, t_{max}, column 2 the top corporate tax rate, τ_{max}, and column 3 measures the difference in the two rates, labeled Δ. As can be seen in the table, the difference in the two rates was huge until the early 1960s and remained a major consideration until the early 1970s. Before 1974, this measure actually understates tax incentives, since during this period individuals setting up a business could divide the business into many separate corporations for tax purposes. If the cost of doing this were zero, then the effective marginal corporate tax rate is simply the minimum corporate tax rate τ_{min}, listed in column 5 of Table 1.

What then limits the amount of income that will be shifted out of the personal tax base into the corporate tax base? To begin with, such income shifting is attractive only for individuals who face a personal tax rate above the corporate tax rate—all other individuals would want to pay out their entire earnings in the form of wages and salaries. Anybody earning an income above the amount listed in column 4 of Table 1 faced a marginal personal tax rate above that of the maximum corporate tax rate, while anyone with an income above the amount in column 6 faced a personal rate above the minimum corporate tax rate. These income levels are low enough that many people had the potential to lower their tax liabilities through shifting income above these amounts into the corporate tax base.[13]

If there were no costs or statutory limits on income shifting, then the effective marginal tax rate on labor income would be the minimum of the corporate and the personal tax rate, as claimed in Feldstein and Slemrod (1980), so that the tax distortion simply reduces the progressivity of the existing income tax. The larger the amount of income employees earn above these cut-off income levels, the larger the amount they would want to shift into the corporate tax base. Any income shifted out of the personal into the corporate tax base biases upward the standard measure of the rate of return to corporate capital, and does so particularly during those time periods when many people face a personal tax rate above the corporate tax rate. The figures in Table 1, for example, suggest that the amount of income shifting should have declined in the 1970s and 1980s, and particularly after

[13] Those with income levels between these two figures had an incentive to shift income into the corporate tax base until their marginal corporate tax rate jumped above their personal tax rate, assuming they cannot easily set up multiple corporations. The main jump in the corporate tax rate occurred at $50,000 of corporate income.

Table 1. *U.S. Corporate Versus Personal Tax Rates*

Year	t_{max}	τ_{max}	Δ	$t > \tau_{max}$ if $Y >$	τ_{min}	$t > \tau_{min}$ if $Y >$
1950	87	42	45	28,000	23	8,000
1951	87.2	50.75	36.45	32,000	28.75	12,000
1952	88	52	36	28,000	30	12,000
1953	88	52	36	28,000	30	12,000
1954	87	52	35	36,000	30	16,000
1955	87	52	35	36,000	30	16,000
1956	87	52	35	36,000	30	16,000
1957	87	52	35	36,000	30	16,000
1958	87	52	35	36,000	30	16,000
1959	87	52	35	36,000	30	16,000
1960	87	52	35	36,000	30	16,000
1961	87	52	35	36,000	30	16,000
1962	87	52	35	36,000	30	16,000
1963	87	52	35	36,000	30	16,000
1964	77	50	27	40,000	22	8,000
1965	70	48	22	40,000	22	12,000
1966	70	48	22	40,000	22	12,000
1967	70	48	22	40,000	22	12,000
1968	75.25	52.8	22.45	44,000	24.2	12,000
1969	77	52.8	24.2	40,000	24.2	12,000
1970	71.75	49.2	22.55	40,000	22.55	12,000
1971	60	48	12	40,000	22	12,000
1972	50	48	2	40,000	22	12,000
1973	50	48	2	40,000	22	12,000
1974	50	48	2	40,000	22	12,000
1975	50	48	2	40,000	22	12,000
1976	50	48	2	40,000	22	12,000
1977	50	48	2	40,000	22	12,000
1978	50	48	2	40,000	22	12,000
1979	50	46	4	45,800	17	7,600
1980	50	46	4	45,800	17	7,600
1981	50	46	4	45,800	17	7,600
1982	50	46	4	60,000	16	11,900
1983	50	46	4	85,000	15	11,900
1984	50	46	4	109,000	15	11,900
1985	50	46	4	113,800	15	12,390
1986	50	46	4	118,050	15	12,840
1987	42	40	2	∞	15	28,000
1988	28	34	—	∞	15	29,750
1989	28	34	—	∞	15	29,750
1990	28	34	—	∞	15	32,450
1991	31	34	—	∞	15	34,000
1992	31	34	—	∞	15	35,800
1993	39.6	34	5.6	140,000	15	36,900

Notes: t_{max} (τ_{max}) represents the personal (corporate) tax rate in the top tax bracket, while τ_{min} is the corporate tax rate in the lowest tax bracket. Δ equals $t_{max} - \tau_{max}$. Y represents personal taxable income.

1986.[14] In fact, Auerbach and Poterba (1987) do report a declining reported corporate profit rate by the 1980s that they find hard to explain,[15] while Lindsey (1986) reports a jump in the reported taxable income of high income individuals during this period.

Income shifting must involve some offsetting nontax costs, since individuals facing personal tax rates above the corporate tax rate do report receiving substantial wage and salary income. Given these nontax costs, individuals will engage in income shifting only to the point where at the margin the resulting tax savings and the marginal nontax costs just counterbalance. To the extent to which these nontax costs are lower in particular types of firms, a tax incentive to engage in income shifting encourages the entry or growth of these types of firms. The question is the nature of the nontax costs, and their implications for the relative attractiveness of different types of firms. This paper examines the implications of several types of nontax costs.

Liquidity Constraints

One obvious omission from the initial story is that when individuals accept lower wage payments in exchange for corporate equity, they have lower cash flow unless they immediately sell the equity. But the incentive to engage in income shifting drops and can even disappear if the shares are in fact sold quickly, as seen in the formulas in the Appendix, since a quick sale results in immediate capital gains tax liabilities. If individuals are liquidity constrained, then income shifting is worthwhile only if the liquidity constraints are not too costly. In particular, with liquidity constraints, income shifting requires a drop in current consumption. The resulting increase in the employee's implicit discount rate will eventually make further income shifting unattractive. The question is then how binding these liquidity constraints are likely to be. While the firm (or other financial institutions) can in principle make loans to the individual,[16] there are implicit limits on the extent to which the firm can do this. For one, in the United States, the firm can face substantial tax penalties if it accrues earnings from

[14] If employees switch from qualified stock options to some form of deferred compensation (e.g., nonqualified stock options), the change in reported corporate and personal incomes will show up only several years after the initial tax change, when the deferred compensation is finally paid out.

[15] The corporate profit rate increased, however, in 1993 according to preliminary data, as would be expected given the jump that year in the top personal tax rate.

[16] These loans result in a further shift of taxable income from the individual to the firm due to the resulting interest deductions for the individual and interest income for the firm.

financial assets that cannot be justified on legitimate business grounds. In addition, equity makes poor collateral for a loan because of its volatile value, and this is particularly true for equity that is not publicly traded. The available U.S. data suggest that such loans to shareholders are of trivial size, implying these costs are important. Given the difficulties individuals face in borrowing against equity or against their future earnings, only those with substantial liquid assets from other sources will be in a position to make substantial use of income-shifting opportunities, reducing its attractiveness on equity grounds. Liquidity constraints, however, do not generate obvious differential effects of this tax distortion on particular types of firms.

Risk-Bearing Costs of Equity Compensation

Another omission from the above story is that corporate equity is risky, imposing an extra risk-bearing cost on an employee who receives equity rather than wages and salaries as compensation. In principle, however, the firm can offset this risk by adjusting wage payments ex post so that the total compensation from wages and equity holdings involves the same risk characteristics that the employee would have faced with wage payments alone.[17] This form of arbitrage between different forms of compensation allows the employee to take advantage of the differential tax rates, while bearing no extra risk.

How feasible is it, however, for the firm to "sterilize" the risk from equity compensation through a suitable readjustment in wage payments? If the contract is implicit rather than explicit, the firm has an incentive to default on the promise ex post if share prices fall. An explicit contract is difficult, however, when shares are not traded, since the ex post price of the shares is unobserved. Any "sterilization" also involves employees accepting a short position in the firm's shares as part of their compensation, which can provide a costly signal to the financial markets if it becomes public knowledge. I am unaware of any such attempts by firms to "sterilize" risks.

If sterilization is infeasible, what are the implications for income shifting? To some degree, the firm wants to tie the employee's compensation to the firm's share performance even ignoring taxes, as argued in the principal agent literature, so compensation in shares to this extent does not need to be "sterilized." Ignoring tax considerations, the firm chooses the amount of equity compensation to trade off the extra risk-bearing costs against the

[17] Since the employee would want to postpone selling the equity received each year from the firm, this adjustment needs to take into account the risky return on all holdings of equity in the firm and not just on those shares issued most recently.

efficiency gains from more high-powered incentives. Figures 1a and 1b describe the marginal gains and losses from more equity compensation for employees. Only in Figure 1a is there any equity compensation in equilibrium. In each diagram, standard models of risk premiums imply that the marginal risk-bearing cost curve will be upward sloping while plausibly the marginal-efficiency-gain curve will slope downward owing to diminishing returns to improved incentives.[18] Presumably, there are additional risk-bearing costs even on the first share of equity paid as compensation, since an employee's welfare is closely tied to that of the firm even when he does not own any of the firm's equity. The equilibrium equity compensation is denoted by E^* in each diagram, under the assumption that negative equity compensation is infeasible.

Tax gains from additional equity compensation cause the marginal gains curve to shift upward by the size of this tax gain, where the tax gain will be proportional to $t - \tau$. The new level of equity compensation is denoted by E_t^*. Equity compensation increases if the employee not only saves on taxes (e.g., faces a $t > \tau$) as a result but also would have received equity compensation even ignoring taxes. For those employees whose marginal personal tax rate is below the corporate tax rate, the tax gain from equity compensation is negative, reducing any equity compensation they would otherwise have been receiving. Even if the tax gain is positive, if the employee would not receive equity compensation ignoring taxes, the tax gain may or may not be sufficient to make any equity compensation worthwhile. On net, I conclude that when the firm cannot "sterilize" the extra risk that equity compensation entails, tax incentives will affect the compensation primarily of high-income employees who would receive some equity compensation in any case.

Even among high-income employees, the degree to which the optimal compensation scheme involves equity varies substantially by job. The normal presumption is that use of equity as compensation makes sense only for the top few employees in a firm, whose behavior is important enough for the performance of the firm to have a visible effect on the firm's equity values, and whose marginal product is otherwise particularly hard to measure. In a large firm, no one employee's performance may matter all that much for the firm's share value, so that equity prices will be a poor measure of the marginal product of even the top executives. In a small firm, however, the actions of any one employee can matter a great deal for the firm's share value, suggesting that equity compensation makes sense for a larger frac-

[18] The efficiency gain depends on the resulting increase in the employee's effort and the implied gain to outside shareholders from the extra effort. If there is an upper limit on the amount of the employee's effort, the marginal gains must eventually asymptote to zero.

Figure 1a. *Equilibrium Equity Compensation*
(Top Executives)

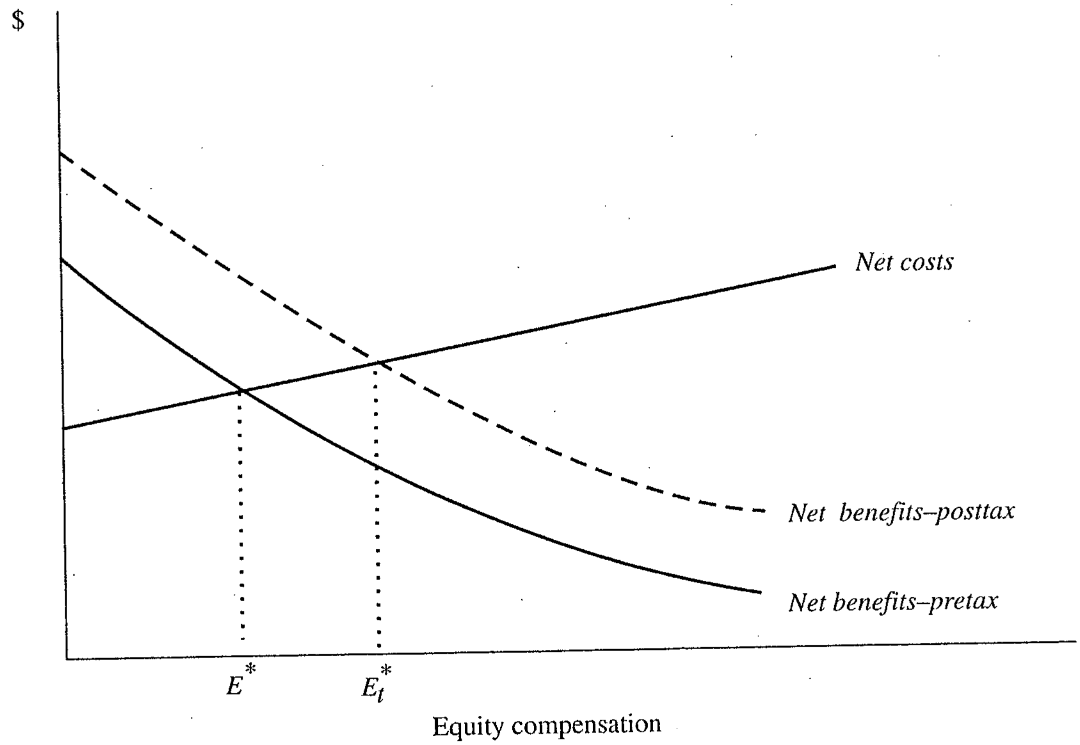
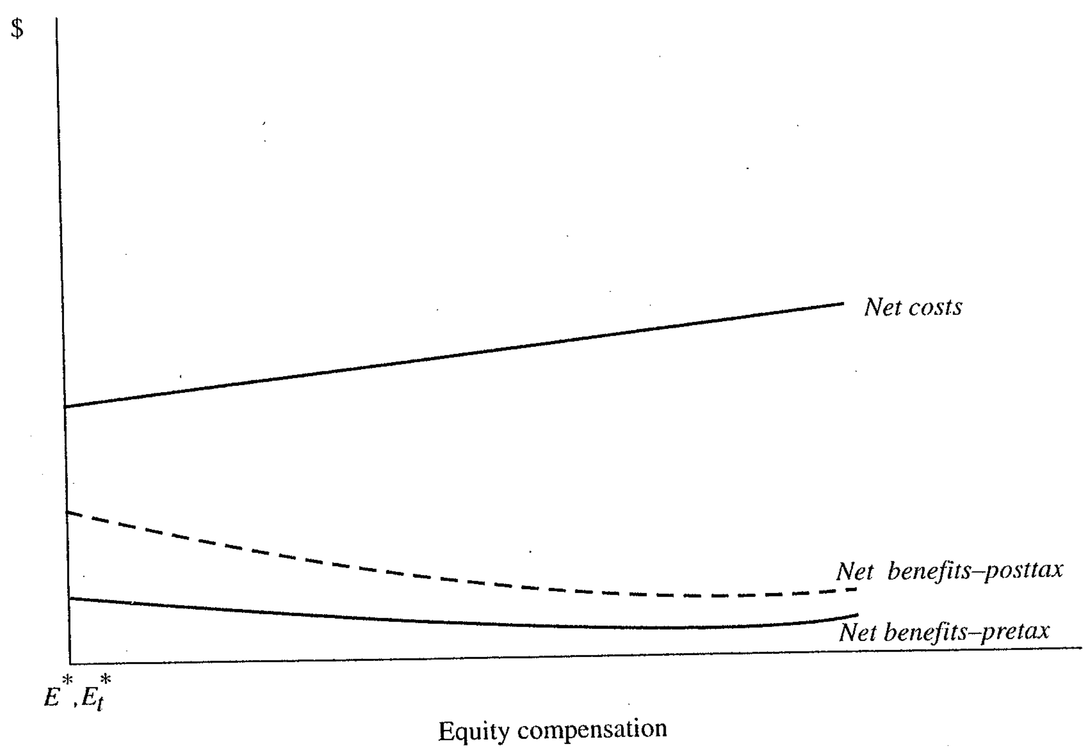


Figure 1b. *Equilibrium Equity Compensation*
(Most Employees)



tion of the firm's employees and should constitute a larger fraction of their compensation on incentive grounds.[19]

Therefore, a tax distortion favoring equity compensation should favor small over large firms, and favor occupations whose marginal product is difficult to measure through other means. Since entrepreneurial firms will find it harder to measure the marginal product of their employees, given the uncertainties about the ultimate payoff to particular activities, they would be more likely to use equity compensation in any case, and so would be favored by these tax incentives relative to copycat and tax shelter firms.

Asymmetric Information

Another factor that can limit the use of equity compensation is asymmetric information between the employee and the person deciding on the compensation scheme regarding the true value of the firm's equity.[20] Intuitively, the firm has a stronger inclination to pay the employee with equity if it knows that this equity is overvalued. As a result, the employee, on seeing the firm offer equity as compensation, infers that the equity is likely to be worth less than he otherwise thought. Ignoring tax considerations, if the firm wants to compensate with equity, the employee does not want to accept it. For any given tax incentive favoring equity, only those firms that are doing unexpectedly badly will end up using equity compensation. In equilibrium, firms will make greater use of equity compensation when their employees are in higher tax brackets and when problems with asymmetric information are less severe.

To see this, consider the following simple example. Each firm has a homogeneous labor force facing some personal tax rate t on ordinary income and no capital gains tax rate. While t can vary across firms, assume for simplicity that it does not vary within a firm. The corporate marginal tax rate is τ. Assume that both employees and the firm are risk neutral, and neither faces liquidity constraints. Ignoring information asymmetries, compensation will be either entirely wages or entirely equity: with pretax wage compensation of W, the employee receives $W(1 - t)$ net of tax, at a cost to the firm of $W(1 - \tau)$. If instead the employee receives as compensation

[19] Employees involved with the production of intangible assets (e.g., managerial ideas or product designs of uncertain value) would also have a marginal product that is difficult to measure other than through equity values.

[20] When the shares are publicly traded, the employee knows the current market price. However, asymmetric information is still very much an issue since the firm should have information the market does not about the firm's true value, suggesting that it knows whether the equity price will tend to rise or fall over time as the market gradually infers this information.

equity with market value $W(1 - t)$ but a negligible book value, he is left unaffected but the cost to the firm becomes $W(1 - t)$. Equity compensation sufficient to leave the employee as well off as with wage compensation is therefore cheaper to the firm only if $t > \tau$.

Now consider the effects of asymmetric information. Based on the information the employee has before seeing the firm's compensation offer, he expects that the firm's equity is worth $\bar{V}$ per share. He also realizes that the firm has better information about the firm's true share value. The firm's expectation for the firm value is denoted by V, where $V = \bar{V}(1 + \tilde{\epsilon})$. By assumption, $E\tilde{\epsilon} = 0$ and $\tilde{\epsilon} > -\bar{V}$.

Assume that the firm can make a take-it-or-leave-it offer to each employee of some number of equity shares, s, per dollar of pretax wage compensation.[21] The firm gains from such an offer only if $(1 - \tau) > sV$. Among the values of s satisfying this equation, the firm would want to offer the smallest value that remains acceptable to the employees.

How will the employees respond? The employees realize that the maximum possible value of $\tilde{\epsilon}$, denoted by ϵ^*, consistent with the firm offering s shares in place of each dollar of wage compensation satisfies

$$(1 - \tau) = s\bar{V}(1 + \epsilon^*). \tag{1}$$

Seeing an offer of s shares then implies that $\tilde{\epsilon} < \epsilon^*(s)$. The employee gains from the offer only if

$$s\bar{V}\left[1 + \epsilon^-(s)\right] \geq (1 - t), \tag{2}$$

where $\epsilon^-(s) \equiv E[\tilde{\epsilon} | \tilde{\epsilon} < \epsilon^*(s)]$.

Equations (1) and (2) are both satisfied for a particular value of s only if

$$\frac{t - \tau}{1 - t} \geq \frac{\epsilon^* - \epsilon^-}{1 + \epsilon^-}. \tag{3}$$

The right-hand side of this equation is simply a function of ϵ^*. As ϵ^* increases, assume for simplicity that $(\epsilon^* - \epsilon^-) / (1 + \epsilon^-)$ also increases.[22]

[21] If it can restrict this offer arbitrarily to a subset of the employees, then a separating equilibrium may be possible, that is, a firm with a higher value of $\tilde{\epsilon}$ can offer a lower value of s to a smaller fraction of its employees. For simplicity, assume that all otherwise identical employees must receive the same offer, and so focus on a pooling equilibrium. The key qualitative properties of such a separating equilibrium are the same as those of the pooling equilibrium focused on here.

[22] A sufficient condition for this is that $\tilde{\epsilon}$ has a uniform distribution. The right-hand side equals zero when ϵ^* is at its lower bound. Similarly, when $\epsilon^* = \infty$, then $\epsilon^- = 0$ and the right-hand side is infinite. Therefore, the right-hand side is increasing on average over the range of ϵ^*. However, in general, it may not be a monotonic function of ϵ^*, for example, it drops discretely at any mass point in the distribution of $\tilde{\epsilon}$.

Under this assumption, the maximum value of ϵ^* consistent with both equations (1) and (2) is the value that leads equation (3) to be satisfied with an equality. Denote this value by ϵ_M^*.

The firm will want to offer employees the smallest value of s consistent with equation (3). According to equation (1), as s decreases, ϵ^* increases. The maximum value of ϵ^* consistent with equation (3) therefore implies a minimum value of s consistent with share compensation, which is denoted by s^*. If a firm makes an equity offer to the employees, therefore, it will offer them s^* shares in place of each dollar of wage compensation regardless of its true value of $\tilde{\epsilon}$. Only those firms with $\tilde{\epsilon} < \epsilon_M^*$ will make such an offer, however. The gain to the firm from making this take-it-or-leave-it offer to an employee is simply $s^* \bar{V}W\,(\epsilon_M^* - \tilde{\epsilon})$ and the average gain per employee among those firms that offer equity as compensation equals $s^* \bar{V}W\,(\epsilon_M^* - \epsilon^-) = W(t - \tau)$.

Therefore, asymmetric information implies that only a fraction of the firms will use equity compensation, in particular those firms that are doing unexpectedly badly and so have $\tilde{\epsilon} < \epsilon_M^*$. The higher the tax rate t faced by the firm's employees, the larger is ϵ_M^* and so the larger is the proportion of firms that choose to offer equity compensation. Also, the proportion of firms offering equity compensation will be larger in sectors where asymmetric information is less important. A tax incentive favoring equity compensation therefore favors those sectors where asymmetric information problems are smaller. In particular, the expected gain to a firm per employee from the tax distortion, evaluated before it learns its value of $\tilde{\epsilon}$, equals $\Phi(\epsilon_M^*)W(t - \tau)$, where $\Phi(\cdot)$ is the cumulative distribution function for $\tilde{\epsilon}$ and $\Phi(\epsilon_M^*)$ is therefore the probability that a firm will use equity compensation. As t increases, given W, by the envelope theorem the ex ante gain to firms is simply $\Phi(\epsilon_M^*)W$, and so is higher in those sectors with fewer problems due to asymmetric information.

Which types of firms face fewer problems from asymmetric information, and so gain relatively more from the tax incentive favoring equity compensation? The answer can only be speculative. Plausibly, asymmetric information problems will be less severe among the largest publicly traded firms, since these firms are under intense scrutiny from security analysts. Problems will also be less severe among the smallest firms, since in a small firm each employee should have substantial knowledge about the status of the firm. Firms of intermediate size would plausibly face the worst problems from asymmetric information, particularly if they are not publicly traded, since they receive little attention from the financial markets and since any one employee has relatively little information about the performance of the firm as a whole. Therefore, larger tax incentives favoring equity compensation should induce a shift in activity toward firms of extreme sizes.

How problems of asymmetric information differ among entrepreneurial versus copycat and tax shelter firms is unclear. Certainly, the overall risk faced by entrepreneurial firms is much higher. This does not imply that information is more asymmetric, however—with less known generally, there is less room for asymmetric information. Empirically, the issue is whether entrepreneurial firms are more likely to use equity compensation, and here the presumption is that the answer is yes, implying that these firms gain relatively more from tax incentives favoring equity compensation.

Effects of Nonlinear Tax Schedules on Risk Taking

In the presence of risk, additional tax considerations arise when the tax schedule is nonlinear. Consider for example a one-period project paying a random pretax return of $\tilde{\rho}$. Assume for simplicity that investors are risk neutral. If this project were undertaken by a large corporation that faces a constant marginal tax rate of τ on its cash flow regardless of the outcome of the project, then the project breaks even if and only if $E\tilde{\rho}(1 - \tau) = 0$, which is equivalent to $E\tilde{\rho} = 0$. Under these assumptions, the size of τ has no effect on the attractiveness of the project. Implicitly, the government is simply acting as a co-investor, covering the fraction τ of all costs and receiving the fraction τ of all returns.

When the tax schedule is nonlinear, however, taxes do affect the relative attractiveness of different types of projects. Auerbach and Altshuler (1990), for example, emphasize the lack of full loss offsets under existing U.S. corporate taxes,[23] and note that this provision discourages risky investments. Without any loss offsets, if a new firm undertakes a project that earns a zero expected return pretax, its net-of-tax return equals $-\tau \max(\tilde{\rho}, 0) < 0$. The higher τ is, the greater the net-of-tax loss. A new corporation therefore cannot compete with a large existing corporation on such a project.

The tax law commonly provides more flexibility than the above argument tries to capture, however. To begin with, the above argument ignores possible multiple brackets under the corporate tax. Assume, for example, that the corporate rate is $\alpha\tau$ on income less than y, and τ on income above y. In addition, following the U.S. law, assume that while the corporate tax does not allow loss offsets, the personal tax does allow business losses to be deducted from other income.[24] Finally, assume firms face no costs of chang-

[23] The U.S. tax does allow loss carrybacks for up to three years and loss carryforwards for up to 15 years. Auerbach and Altshuler make a convincing case, however, that these provisions do not closely approximate full loss offset.

[24] Since 1986, the U.S. tax law has prevented "passive losses" from being deducted from other income sources. Losses experienced by someone actively running a business remain deductible, however.

ing between corporate and noncorporate organizational forms, and that firms can choose ex post which form to use each year.[25]

Given this nonlinearity in the tax schedule, if a new firm undertakes the above project, the net-of-tax return on the project equals

$$(1-t)\min(\tilde{\rho},0)+(1-\alpha\tau)\max[\min(\tilde{\rho},y),0]+(1-\tau)\max(\tilde{\rho}-y,0). \qquad (4)$$

In contrast, when a large firm undertakes this project, its expected net return equals $(1-\tau)E\tilde{\rho}$, as long as the project is small enough that it never drives the corporation's overall income below y. New firms, therefore, have a competitive advantage over large firms in undertaking such a project if the expectation of expression (4) is larger than $(1-\tau)E\tilde{\rho}$. A new firm has a tax advantage if

$$E\left\{(\tau-t)\min\left(\tilde{\rho},0\right)+(1-\alpha)\tau\max\left[\min\left(\tilde{\rho},y\right),0\right]\right\}>0. \qquad (4a)$$

This inequality is satisfied when $t>\tau$ and $\alpha<1$, as in the United States. These criteria imply that a new firm passes on a larger fraction of any losses to the government, and pays taxes on a smaller fraction of at least initial profits to the government, than occurs when a large firm undertakes the same project. High-income individuals therefore have a competitive advantage when setting up a new firm to undertake this project, and the more so the higher their personal tax bracket. In contrast, individuals in a lower personal tax bracket setting up a new firm will be at a competitive disadvantage relative both to large firms and to individuals in higher tax brackets undertaking the same project. These individuals in lower tax brackets would instead pursue such a project through a large existing firm.[26]

When will a new firm also be at a competitive advantage in undertaking the project relative to a small existing firm, which for example starts with taxable income of some amount A before undertaking the project? For example, if $A>y$, the after-tax expected return on the project for a new firm exceeds the expected net return on the same project for a small existing firm by

$$E\left\{(\alpha\tau-t)\max\left[\min\left(\tilde{\rho},y-A\right),-A\right]\right.$$
$$\left.+(\tau-t)\max\left[\min\left(\tilde{\rho},0\right),y-A\right]+\tau(1-\alpha)\max\left[\min\left(\tilde{\rho},y\right),0\right]\right\}.$$

[25] In the United States, choices can be changed midyear, but cannot be changed again for five years. Since firms commonly have a string of years with tax losses initially, and taxable profits later, this restriction should not be that binding.

[26] If there are nontax advantages to pursuing a new project through a new firm, for example, there is no need to force changes on an existing organization and no need to spend time convincing many other managers in a large firm about the value of the project, then the tax law imposes a tax distortion discouraging individuals in low tax brackets from pursuing ideas for productive projects.

If $t > \tau$ and $\alpha < 1$, then a new firm has a competitive advantage over a small as well as a large existing firm when undertaking the project.

The same reasoning can be used to compare the relative sizes of the tax benefit to "copycat" projects that involve relatively little risk compared with more innovative "entrepreneurial" projects where the risks are substantial. In general, the after-tax expected return on a project equals $E[\tilde{\rho} - T(\tilde{\rho})]$, where the function $T(\cdot)$ describes the taxes due for any given outcome. If the function $T(\cdot)$ is concave, then adding risk, holding expected returns constant, lowers expected taxes, and conversely.[27] Therefore, if the tax function is concave, then the tax law favors entrepreneurial over copycat entrants, and vice versa.[28]

The tax function is concave if the marginal tax rates are monotonically declining with income. At least in the United States, however, the relevant tax function is more complicated, since the marginal tax rates do not change monotonically with income, leading to an ambiguous ranking of the tax effects on entrepreneurial versus copycat projects. For example, consider two projects each costing a initially and each having the same expected before-tax return ρ^*. The "copycat" project succeeds with a reasonably high probability p_c, whereas the entrepreneurial project succeeds with a low probability p_e. Denote the payoff when the copycat project succeeds by b_c, and that when the entrepreneurial project succeeds by b_e. By construction, $\rho^* = -a(1 - p_c) + b_c p_c = -a(1 - p_e) + b_e p_e$. Assume that $0 < y < b_c < b_e$. If the two projects were undertaken by a large firm, they would be equally attractive. When they are each undertaken by a new firm, the after-tax return to the entrepreneurial project exceeds that of the copycat project by

$$(p_c - p_e)\big[(t - \tau)a + y\tau(\alpha - 1)\big]. \tag{5}$$

Both terms inside the brackets are positive if $t > \alpha\tau > \tau$, implying a concave tax function. Under U.S. law, however, the first term will be positive but the second term is negative. The tax rates listed in Table 1 indicate, for example, that the first term in equation (5) would plausibly have been dominant until the mid-1960s or early 1970s, whereas the second term should have dominated since then. To this extent, the tax law provided more of a benefit to entrepreneurial firms prior to the early 1970s, and more of a benefit to copycat firms since then.

[27] See Rothschild and Stiglitz (1970) for a formal demonstration.

[28] If the law is to discourage copycat projects while encouraging entrepreneurial projects, then it should have a locally convex rate structure over the range of returns relevant for a copycat project, yet have a sufficiently concave rate structure over the broader range relevant for an entrepreneurial project that the entrepreneurial project gains on net.

The tax law will in fact discourage copycat projects undertaken by new firms, relative to projects with the same pretax expected return undertaken by large firms, if

$$(t-\tau)a(1-p_c)+\tau(1-\alpha)yp_c<0. \tag{6}$$

For the tax law in addition to encourage entrepreneurial projects, equation (4a) applied to this example implies that

$$(t-\tau)a(1-p_e)+\tau(1-\alpha)yp_e>0 \tag{6a}$$

Given that $p_e < p_c$, both equations can hold for particular values of $t > \tau$ and $\alpha > 1$.[29] Of course, copycat projects can still be undertaken by large firms without tax penalty, but doing so may entail nontax costs as described in footnote 26.

How does this nonlinearity in the tax schedule affect tax shelter activities? If these activities are risk free and earn a stable rate of return ρ across time, then they break even if ρ equals zero, regardless of the cash-flow tax rate they face.[30] When the taxable rate of return differs across time, however, then the nonlinearity in the tax schedule can matter. Consider, for example, a risk-free project that experiences tax losses during its initial years and taxable profits in later years. If this project is undertaken by a large corporation, then the only issue is whether the present value of earnings is positive. If instead it is undertaken by a new firm, then the firm can choose to be noncorporate during the years it generates tax losses and then incorporate when it starts to earn positive taxable income. Simply relabeling the terms in the above expressions would show that the project earns more net of tax when undertaken by a new firm than by a large existing firm when $t > \tau > \alpha\tau$. During time periods when deductions are particularly front loaded, or when personal tax rates exceed the corporate tax rate, tax

[29] Copycat projects, being less risky, require less time from a manager to set up. Once they are set up and running smoothly, the manager is likely to want to sell out and use his skills to set up yet another venture. In contrast, entrepreneurial projects, which explore much more uncertain ideas, will likely demand many more years of a manager's skills to reach maturity. As a result, managers of copycat firms are likely to realize their capital gains more quickly than owners of entrepreneurial firms. To this extent, a higher capital gains tax rate can also be used to discourage copycat firms relative to entrepreneurial firms.

[30] When the definition of taxable income differs from economic income, activities that generate tax losses will be favored by the tax law and would likely be owned in noncorporate form by individuals in top tax brackets, whereas activities generating taxable profits will be discouraged by the tax law and will either be corporate or operated in noncorporate form by individuals in low tax brackets. The same considerations apply to any activities generating nonzero taxable income that consider changing organizational form to take advantage of tax rate differences. See Gordon and MacKie-Mason (1994) for further discussion.

shelter activity should be particularly prevalent. The acceleration of depreciation deductions in the United States during the 1981–83 tax reforms, for example, provided such a front loading, stimulating the rapid growth of tax shelter activity during this period.[31] If the tax law is to encourage entrepreneurial activity without generating major "tax shelter" activity, it must have a time pattern of tax deductions that corresponds to the time pattern of income for a project, so that riskless projects cannot take advantage of a rate structure designed to encourage investment in highly risky projects.

Note that the above stories suggest that firms will choose to be noncorporate when they have tax losses and to be corporate when they have taxable profits. This provides another explanation for the high observed corporate rate of return, as well as the losses commonly reported by noncorporate firms.[32]

Tax Effects on the Availability of Outside Financing

Commonly, an individual starting a new firm does not have sufficient savings himself to finance the entire start-up costs, given not only the initial capital costs but also the costs of covering the likely losses during the first few years of operations of the firm. New firms do not always find it easy to acquire outside financing, however. Given the very high failure rate of new firms, debt and equity holders in a new firm would face strongly conflicting interests, generating severe agency and bankruptcy costs. As a result, outside financing commonly takes the form of equity purchases by "venture capitalists." With equity financing, however, asymmetric information between the new entrepreneur and outside investors limits the extent of outside financing.[33] Outside investors, for example, cannot judge to what degree the entrepreneur is simply pursuing an enjoyable hobby, cannot assess well how risky the proposed project is, and normally have little information about the managerial skills of the entrepreneur. The degree to which a market survives, in spite of these complications, depends on the tax incentives faced by the outside investors as well as by the entrepreneur.

[31] Firms that are in a position to borrow heavily against their fixed capital would be in the best position to shift earnings across time periods to take advantage of changing tax rates over time. See, for example, Gordon, Hines, and Summers (1987) for further discussion.

[32] For early evidence of such a pattern of returns, and an explicit recognition of the tax explanation, see Kahn (1964).

[33] The problems arising from asymmetric information would be less with debt finance, so that models that ignore bankruptcy costs (e.g., Myers and Majluf, 1984) forecast debt rather than equity finance. Consistent with the dominant role of venture capitalists, assume that this advantage of debt is more than outweighed by the resulting agency and bankruptcy costs.

Consider the simple example in which the potential entrepreneur is currently earning a wage income of Y, taxable at his personal tax rate t_e.[34] He is considering starting a new firm that would run losses of L per year for N years, and then earn A per year for $T - N$ years—projects are heterogeneous owing to variation in the date N when the project first becomes profitable. For simplicity, assume that the interest rate is zero. The problem the entrepreneur faces is that he does not have the personal savings on hand to cover the start-up costs of LN, and so must seek outside financing.[35]

Rather than modeling the asymmetric information problems directly, assume for simplicity that the outside investor can acquire complete information at an average cost C per project in fact undertaken. This cost presumably consists of time spent meeting potential entrepreneurs and checking with industry experts about the entrepreneurs' managerial skills and the plausibility of their claims about the proposed projects. If, given complete information, the project looks attractive, then the outside investor buys some fraction s of the firm's shares sufficient to allow the project to proceed.

Under what conditions do both the entrepreneur and the outside investor benefit from undertaking the project? Assume that $t_e > \tau$, so that the firm will be organized as a partnership during its first N years of operation and as a corporation thereafter.[36] By agreeing to buy the fraction s of the firm's shares, the venture capitalist agrees to cover the fraction s of the yearly expenses during the start-up period. In addition, he must be willing to pay enough to the entrepreneur for this fraction s of the firm's shares so that the entrepreneur can cover the remaining fraction of the firm's start-up expenses. Assume that there are many venture capitalists compared with the number of entrepreneurs with worthwhile projects, so that competition implies that venture capitalists break even in equilibrium.

The trade-offs for the entrepreneur are as follows: if he pursues the project, then his returns consist of several parts. Initially, he sells shares in the firm for an amount sV, where V is the value the market assigns to the firm. Assuming the book value of the equity is zero, this would be taxed entirely as capital gains, yielding $sV(1 - g_e)$ net of tax, where g_e is the entrepreneur's capital gains tax rate. During the first N years of operations of the firm, it runs tax losses that are deductible for each of the partners. The entrepreneur's after-tax share of these expenses during the first N years is

[34] To the extent that employees of large firms can engage in income shifting, the tax rate here would be reduced to reflect the gains from income shifting when employed by a large firm.

[35] Assume though that his personal savings are sufficient to cover his own living expenses even if he earns no cash income during the start-up years.

[36] If instead $t_e < \tau$, then a new firm will choose to be noncorporate throughout its life.

$(1 - s)LN(1 - t_e)$.[37] Once the firm starts to earn income, however, it incorporates. The share of the net-of-corporate tax income during the final $T–N$ years going to the entrepreneur is $A(1 - \tau)(1 - s)(T - N)$.[38] For simplicity, assume that this income is entirely retained within the firm and the entrepreneur can hold the firm's shares until death (without any nontax costs) so that the resulting capital gains are not taxed. Given all of these implications, the entrepreneur will find starting a new firm attractive if and only if

$$sV(1 - g_e) - (1 - s)LN(1 - t_e) + (1 - s)A(1 - \tau)(T - N) \geq YT(1 - t_e). \quad (7)$$

When does the outside investor break even on the project? He initially spends time worth C on average for each project in fact undertaken to verify the data about the entrepreneur and his project. Since the return to his time would otherwise be taxed at ordinary rates, the opportunity cost of this time is $C(1 - t)$ where t is the investor's personal tax rate. The investor in addition spends sV immediately buying equity in the firm. As a partner in the firm, he also spends $sLN(1 - t)$ net of tax to cover the firm's start-up expenses. Once the firm starts to earn profits, assume that the investor sells out—at this point, other investors can verify the profitability of the project without spending C, and the entrepreneur would want to liquidate his holdings in order to invest in other venture capital projects. His equity holdings would be worth $sA(1 - \tau)(T - N)$, but owing to capital gains taxes at rate g his net revenue from the sale equals $sA(1 - \tau)(1 - g)(T - N) + gsV$. On net, the outside investor therefore breaks even if

$$-(1 - g)sV - C(1 - t) - sLN(1 - t) + sA(1 - \tau)(1 - g)(T - N) = 0. \quad (8)$$

This equation implicitly determines V as a function of s. Given the fixed costs C, V will be an increasing function of s.

The entrepreneur and the outside investor together find the project worth pursuing if equations (7) and (8) hold simultaneously. Summing these two equations, we infer that a necessary condition for a new firm to open is that

$$sV(g - g_e) + A(1 - \tau)(1 - sg)(T - N) \geq C(1 - t) + LN[1 - t_e - s(t - t_e)] + YT(1 - t_e). \quad (9)$$

One implication of equation (9) is that the potential profits from a new firm are highest if the outside investor is in the highest tax bracket, given that partial $\partial g/\partial t < (1 - g)/(1 - t)$ for any plausible tax schedule. This forecast con-

[37] If the entrepreneur is to have enough funds to cover these expenses, it must be that $sV(1 - g_e) \geq (1 - s)LN(1 - t_e)$.

[38] If the corporate income tax is nonlinear, then $A(1 - \tau)$ would be replaced by the after–corporate tax earnings.

forms with at least U.S. experience regarding venture capitalists. Potential profits are also higher if the entrepreneur is in a higher tax bracket—a sufficient but not necessary condition is $\partial g_e/\partial t_e < (1 - g_e)/(1 - t_e)$, which surely holds under existing statutes.

The profitability of the project will also depend on the fraction of the shares, s, sold to the venture capitalist. Solving for sV from equation (8) and substituting into equation (9), we find that the net profits available to the entrepreneur equal

$$A(1-\tau)(1-sg_e)(T-N) - C\gamma(1-g_e) \\ - (1-g_e)LN[(1-s)\gamma_e + s\gamma] - YT(1-t_e), \quad (10)$$

where $\gamma = (1 - t)/(1 - g)$ and $\gamma_e = (1 - t_e)/(1 - g_e)$. If $\gamma_e \approx \gamma$, so that the entrepreneur and the venture capitalist are in roughly the same tax brackets, then net profits grow when s shrinks since the venture capitalist is under more pressure to realize capital gains quickly. The fraction s will then be reduced to the minimum value sufficient to allow the project to proceed. In contrast, if γ_e is large relative to γ, then there is a joint gain from raising s. In this case, the venture capitalist gains more than the entrepreneur from converting ordinary income into capital gains, and this gain can easily be enough that it would pay the entrepreneur to seek outside financing, in spite of the fixed costs C, even if the entrepreneur has sufficient funds of his own to cover the costs of the project.[39]

When will a new firm be at a competitive advantage relative to a large existing firm in undertaking this project? A large existing firm considering the project has the advantage that it does not presumably need to deal with outside investors, saving the monitoring costs C. However, it may face some nontax costs, D, not present in a new firm, given the difficulties of changing existing operations in a large organization. With a fixed cash-flow corporate tax rate τ, a large firm would break even on the project if

$$A(T - N) = LN + YT + D. \quad (11)$$

Comparing the break-even conditions for new firms and large existing firms, we find that new firms will dominate if and only if

$$A(T-N)\frac{(1-\tau)(1-sg_e)}{1-g_e} - \gamma_e[A(T-N) - sLN - D] - s\,\gamma LN \geq \gamma C. \quad (12)$$

Setting t and g equal to the values relevant for the richest investors, equation (12) characterizes the set of entrepreneurs who will be at a tax

[39] Presumably, the fraction s will be limited by the need to provide the entrepreneur sufficient incentives to undertake the project successfully.

advantage when considering starting a new firm to undertake the proposed project. If γ_e is a monotonically declining function of t_e, then entrepreneurs facing a tax bracket above some cut-off value t_e^* will have a tax advantage relative to large existing firms in undertaking the project, while entrepreneurs in lower tax brackets will be at a tax disadvantage, where t_e^* is the value that causes equation (12) to be satisfied with an equality.[40]

According to equation (12), the likelihood of an entrepreneur obtaining outside financing, and the net gain to those entrepreneurs who do obtain outside financing, is higher the higher the tax rate t faced by venture capitalists, and the lower their capital gains tax rate, g. Changes in t and g will also affect the access of copycat and tax shelter firms to outside financing, however, based on the same type of argument.[41]

Which types of firms would be most affected at the margin by a rise in t or a drop in g is unclear, since this depends on which firms are currently being funded and could gain further by tax rate changes and which firms are at the margin of qualifying for funding. The fixed costs C of judging an entrepreneurial project are undoubtedly much higher than the equivalent costs for a copycat or tax shelter project, so that copycat and tax shelter projects should find it much easier to get outside financing. The effects of tax changes through the availability of outside financing are therefore likely to have less effect on entrepreneurial entrants than on these other types of new firms.

II. Efficiency Implications of Tax Distortions

Assessing the overall efficiency implications of the above tax distortions is not easy. Ignoring any market failures/externalities, the model implies that any changes in behavior induced by the tax law reduce economic efficiency. For example, in equation (12) new firms face added real costs of $C - D$ relative to large existing firms. Without tax distortions, therefore, activities where $D > C$ will be undertaken by new firms while others will occur in existing firms. With tax distortions, the allocation of projects between new and existing firms will depend on tax as well as nontax considerations. To the extent that decisions change because of the tax distortions, inefficiencies arise.[42]

Many complications are ignored by this initial calculation, however. To begin with, it ignores possible externalities generated by a new firm. An

40 Potential entrepreneurs with $t_e < t_e^*$ can still negotiate with a large existing firm to undertake the proposed project, but then face the added nontax costs, D.

41 These tax rates can also affect the amount of resources invested in trying to forecast price changes in the equity of existing firms.

42 This is the approach taken to measuring the efficiency consequences of tax distortions used, for example, in Gordon and MacKie-Mason (1994).

entrepreneurial firm is likely to generate positive externalities, by providing valuable information to other potential entrants. Copycat firms, in contrast, will likely generate negative externalities, by capturing some of the rents going to previous innovators.[43] Therefore, the sign of any correction term to capture the effects of these externalities is unclear, since it depends on the composition of firms that enter in response to a tax change. As described above, the positive externalities should be more important when the top corporate rate is low relative to the initial corporate tax brackets and when risk-free projects generate a relatively stable stream of taxable income over time.

Another important efficiency consideration is the effects of asymmetric information on the opportunities entrepreneurs have to obtain outside financing, and to spread the costs of risk-bearing to outside investors. The implications of asymmetric information for efficiency depends very much on the specific market transactions that are affected by asymmetric information, however. Without tax distortions, are there too few or too many new firms? If too few firms enter without taxes, then any tax distortion favoring more new firms lessens a preexisting distortion and as a result raises efficiency. The converse would be true if too many firms enter ignoring tax distortions. Either outcome is possible. I will first examine a setting in which too many firms enter.[44]

Consider in particular what happens, without tax distortions, when entrepreneurs need to raise LN from outside investors to cover the observed costs of the project, but outside investors cannot observe ex ante the potential return A even after spending C to obtain information about the other parameters of interest. If outside investors offer to provide the financing, LN, in exchange for the fraction s of the firm's shares, then an entrepreneur with a project worth A will accept the offer as long as

$$(1 - s)A(T - N) \geq YT. \tag{13}$$

Knowing this, the outside investor concludes that $A \geq A^*$, where A^* is the value of A at which equation (13) is satisfied exactly. Let $A^+ = E(A \mid A \geq A^*)$. Note that A^+ is an increasing function of s, since at a high value of s only the best projects will be undertaken. The outside investor breaks even on his investment if

$$sA^+(T - N) = C + LN. \tag{14}$$

[43] Risk-free projects that enter simply to take advantage of the differential tax rates yield no obvious externalities.

[44] The possibility of excessive activity, given asymmetric information, was made also in de Meza and Webb (1987).

Equations (13) and (14) together imply that

$$A^*(T-N) = YT + LN + C - s(A^+ - A^*)(T-N). \tag{15}$$

From a social perspective, the marginal project just breaks even if $A^*(T-N) = YT + LN + C$. Therefore, too many projects are undertaken because of the asymmetric information—poor projects get funded because entrepreneurs cannot distinguish them from good projects. If too many projects are funded ignoring tax considerations, then any tax distortion making entry yet more attractive exacerbates this existing distortion, resulting in a first-order efficiency loss.

In contrast, consider the situation when the entrepreneur can undertake a project yielding $A_1(T-N)$ even without outside financing, but with outside financing to cover the observable additional costs LN he can instead earn $(A_1 + B)(T-N)$, where B but not A_1 is observable to outside investors.[45] Assume that the new project is definitely worth undertaking, so that $B(T-N) > LN$. This paper will focus on a pooling equilibrium in which an entrepreneur either offers to sell the fraction s of the shares in the firm for the amount LN or instead chooses not to seek outside financing. In this setting, the entrepreneur will seek outside financing only if $(1-s)[(T-N)A_1 + B] \geq A_1(T-N)$, implying that $A_1(T-N) \leq (1-s)B/s$. Let $A_1^- \equiv E(A_1 | A_1(T-N) \leq (1-s)B/s)$ represent the expected value of A_1, conditional on the information that the entrepreneur is willing to seek outside financing. The expected return to an outside investor is therefore $s[A_1^-(T-N) + B] - LN$. Given the definition of A_1^-, we know that the return to the outside investor is definitely less than the social return from the project, $B - LN$, implying that some good projects will not be undertaken. In this setting, a tax distortion favoring outside financing can potentially raise efficiency.

Similarly, consider a setting where equity compensation is valuable for incentive reasons, but where there is asymmetric information between an employee and the firm regarding the value of the firm's equity. In particular, modify the model of Section I (subsection on Asymmetric Information) by assuming that the true value of the firm equals $\bar{V}(1+\epsilon) + I(s)$, where $I(s)$ is a concave but monotonically increasing function of s that represents the increase in output resulting from the strengthened incentives. Assume $I(s)$ but not ϵ is known by the employees. Contrary to the standard principal-agent model, assume that the employee is risk neutral. As a result, ignoring both taxes and asymmetric information problems, all compensation would take the form of equity.

Focus again on a pooling equilibrium in which the firm either pays only wage compensation or else pays sV in equity compensation per dollar of

[45] This is a simplified version of the model explored in Myers and Majluf (1984).

wages. Adding this term $I(s)$ to the previous analysis implies that the firm is just indifferent to paying equity rather than wage compensation if $\epsilon = \epsilon^*$ where ϵ^* is characterized by

$$\frac{I(s) - I(0)}{W} + 1 - \tau = s\overline{V}(1 + \epsilon^*). \tag{1a}$$

Equations (1a) and (2) are both satisfied for a particular value of s if

$$\frac{I(s) - I(0)}{W(1-t)} + \frac{t - \tau}{1-t} \geq \frac{\epsilon^* - \epsilon^-}{1 + \epsilon^-}. \tag{3a}$$

As before, the right-hand side of the equation is an increasing function of ϵ^*. Given equation (1a), which defines ϵ^* as a function of s, the right-hand side of equation (3a) is a decreasing function of s. In contrast, the left-hand side of equation (3a) is an increasing function of s. Both the firm and employees therefore prefer equity compensation when s is larger than some value s^*. The firm would then make a take-it-or-leave-it offer of s^* shares in place of each dollar of wage compensation. Using equation (1a), this value s^* then defines a maximum value of ϵ, denoted ϵ_M^* such that the firm in fact offers equity compensation.

While efficiency calls for all compensation to take the form of equity, the market equilibrium implies that only firms with $\epsilon < \epsilon_M^*$ offer equity compensation. The larger is either the efficiency gain from equity compensation or the larger the tax incentive favoring equity compensation, the larger is ϵ_M^*. Therefore, a tax distortion favoring equity compensation pushes the market equilibrium closer to the efficient form of compensation.

III. Empirical Implications of the Model

The basic empirical forecasts from the above story are captured by equation (12). This equation measures the net advantage faced by a potential entrepreneur in a high personal tax bracket, and the disadvantage faced by one in a low personal tax bracket, when each considers opening up a new firm rather than pursuing ideas through an existing firm. During time periods when personal tax rates are more dispersed, incentives in both directions become greater—those in the highest tax brackets face stronger tax incentives to become entrepreneurs while those in the lowest tax brackets face stronger tax disincentives. During such periods, therefore, entrepreneurs should be drawn more heavily from the top tax brackets. In contrast, when the tax schedule is flatter, fewer individuals in top tax brackets but more of those in low tax brackets will choose to become entrepreneurs. As a result, the set of individuals reporting business losses (arising from the start-up of a new firm) should become more concentrated among individuals in top tax brackets when tax rates are more dispersed. Corporate profit rates, particularly for small firms, should also be higher during these periods, given the stronger incentives to engage in income shifting.

Similarly, during periods when many potential entrepreneurs face tax rates above the break-even tax rate t_e^*, there should be many more individuals who choose to be entrepreneurs rather than employees. During such periods, therefore, the percent of individuals reporting business losses should be higher.

Given U.S. tax law, employees in a corporation whose stock is not publicly traded can take greater advantage of income-shifting possibilities than employees in publicly traded firms. This would be particularly true in smaller firms, where asymmetric information problems are less. Therefore, the model also forecasts more employment in small nonpublicly traded corporations when many individuals face personal tax rates above the corporate rate. The amount of corporate activity should change gradually, however, following a tax change favorable to entrepreneurial activity, while the amount of noncorporate activity would change more quickly since any new entrants normally experience tax losses during their first few years of operations.

The model also forecasts more new firms during periods when tax deductions for new investments are most front loaded, allowing even risk-free projects to take advantage of the differential tax rates faced by corporate versus noncorporate firms. In the United States, this was a particularly important consideration between 1981 and 1986. That the projects encouraged during this period were more likely to be risk free would perhaps be reflected in a greater concentration of the reported tax losses in the few industries, for example, real estate and oil and gas drilling, where deductions are both large and heavily front loaded.

The above discussion focused on individuals who would choose to incorporate their firm once it started to earn profits. Individuals in tax brackets below the corporate rate investing in smaller projects, however, could well prefer to keep their firm noncorporate even after it becomes profitable.[46] To the extent that individuals face tax rates below the corporate rate, therefore, reported noncorporate earnings but not noncorporate losses should be high.

If the entry of new firms generates positive externalities, then the economic growth rate should be higher during periods of more rapid entry, when more new ideas are being tested. One indirect test of the hypotheses developed in this paper is therefore to examine the time series for the economic growth rate relative to the time pattern of the tax distortions favor-

[46] See Gordon and MacKie-Mason (1994) for further discussion.

ing entrepreneurial activity. That the growth rate in the United States was high until the early 1970s, when the tax incentive to set up a new firm largely disappeared, is suggestive. Of course, many other factors could be responsible for this time pattern.

IV. Implications for Tax Policy

If any employee can shift income from the personal to the corporate tax base, as assumed in Feldstein and Slemrod (1980), then the corporate tax rate simply serves as the maximum personal tax rate. Therefore, the corporate tax rate should be set equal to the maximum *desired* personal tax rate. If the tax structure is to be entirely transparent, all personal tax rates should be at or below this corporate tax rate. This corresponds, for example, to the tax structure proposed in McLure (1991).

When income shifting is not costless, however, then the size of the corporate tax rate relative to the top personal tax rate has more complicated effects. Only those individuals who find that the tax savings more than outweigh the nontax costs will engage in income shifting. For a variety of reasons argued above, these nontax costs are likely to be smaller in new firms than in large existing firms. Therefore, a low corporate rate relative to personal tax rates encourages the entry of new firms.

New firms will consist in part of entrepreneurial firms, which test new and untried technologies with a low probability of a high payoff. New firms also include copycat firms, however, that simply try to duplicate the innovations made by previous entrants, in order to share in the resulting profits. While entrepreneurial firms likely generate important positive externalities, copycat firms generate negative externalities. To favor risky entrepreneurial projects while discouraging less risky copycat projects, the marginal tax rates faced by a new firm should increase and then decline with income. In particular, the corporate tax rate should be a declining function of income, with the initial corporate rate above and the top corporate tax rate well below the top personal tax rates. Ironically, the U.S. tax structure has been moving in the opposite direction during the past 30 years, shifting the tax incentives away from new entrepreneurial firms and toward new copycat firms and tax shelters (riskless projects that generate large tax losses during some years and large tax profits during other years).

When entrepreneurial activity generates positive externalities, a tax distortion favoring entrepreneurial activity has the potential to raise economic efficiency. Most countries have a corporate tax rate well below the top personal tax rate. The resulting stimulus to entrepreneurial activity could be one explanation. Other explanations of course also exist. For example, given the taxation and tax deductibility of nominal interest, a high corporate tax rate leads to an excessive use of debt finance, as described in Gordon and Malkiel (1981). In addition, a high corporate tax rate induces profitable firms to shift to a noncorporate status, as emphasized in Gordon and MacKie-Mason (1994), even though on nontax grounds they may operate more profitably in corporate form. Furthermore, there is an incentive to keep the corporate rate below the personal tax rate because of the threat of transfer pricing being used to shift profits into tax havens, as discussed in Gordon and MacKie-Mason (1995). This paper proposes yet another cost of having a high corporate tax rate.

APPENDIX

Tax Implications of Qualified Stock Options

How do taxes affect the relative attractiveness of receiving compensation in the form of wages versus qualified stock options, given U.S. tax law? Consider first the treatment of wage payments. A dollar of pretax corporate income paid out as wages results in a net cost to the firm of $(1 - \tau)$ and net income to the employee of $(1 - t)$. Per dollar of net cost to the firm, the employee receives $(1 - t)/(1 - \tau)$.

What changes if instead the employee receives a dollar of pretax corporate income in the form of qualified options? If the firm transfers a dollar's worth of options to the employee, as valued by the market, the cost to the firm is simply a dollar—the firm is not allowed any tax deductions as a result of this form of compensation.

What is the after-tax value of this transfer to the employee? If the employee faced the same future tax obligations on the options as he would have had he simply purchased the option directly, then the employee would value the options at a dollar. Assume as a simple example that the exercise price on each option is the initial share price, share prices increase at rate c without uncertainty, and options must be exercised within T years. If he purchased an option directly, and the current share price is 1, then the value P of the option must satisfy

$$P = \left[\left(e^{cT} - 1\right) - g\left(e^{cT} - 1 - P\right)\right]e^{-dT}, \tag{A1}$$

where g is the capital gains tax rate and d is the individual's discount rate. When he later sells the resulting shares, his basis will be e^{cT}.

If instead he receives the option as compensation, he again will exercise the option at date T but under U.S. law he owes no taxes at that point. However, his basis when he later sells the shares will be 1 rather than e^{cT}. Assume this later sale takes place in year T+n when his capital gains tax rate is g_n. Then, relative to purchasing the options directly, he initially saves $g[e^{cT} - 1 - P]e^{-dT}$ in taxes but later owes an extra $g_n(e^{cT} - 1)e^{-d(T+n)}$ in taxes. The net value of an option to him is therefore $P + [e^{cT} - 1]$ $e^{-dT}(g - g_n\, e^{-dn}) - gPe^{-dT}$. The personal tax treatment of options received as compensation is more favorable to the extent that capital gains taxes are postponed until the shares acquired through the option are ultimately sold, but is less favorable to the extent that the implicit price of the option is not deductible from the capital gains tax base. In general, either effect could be larger. A common outcome, though, is that the acquired shares are held until death, implying that the value of the option exceeds P.

When the firm pays the employee a dollar's worth of options, using equation (A1) it is easy to see that the value of the compensation to the employee equals

$$1+\frac{\left(g-g_n e^{-dn}\right)\left(1-ge^{-dT}\right)}{1-g}-ge^{-dT}. \tag{A2}$$

If g is small enough that the second and third terms in equation (A2) can be ignored, then the gain from receiving a dollar of compensation in qualified stock options rather than wages equals $1-(1-m)/(1-\tau)=(m-\tau)/(1-\tau)$. Commonly, the gain will be somewhat larger due to the further gains from being able to postpone paying the capital gains taxes normally due when the option is exercised.

Tax Implications of Stock Purchase Rights

In a firm that is not publicly traded, employees can be given shares of equity in the firm as compensation rather than wages. For tax purposes, these shares should in principle generate taxable income for the individual and a tax deduction for the firm equal to the market value of the equity. However, when shares are not publicly traded, no such value is directly observable. While the book or accounting value can be used as an approximation instead, this value can be small compared with the market value, particularly in firms whose value derives from the return to ideas rather than physical capital.

Denote by v the ratio of the valuation used for tax purposes relative to the market valuation as perceived jointly by the firm and the employee. If the firm were to pay a dollar in wages to the employee, the employee receives $1-t$ net of taxes at a net-of-tax cost to the firm of $1-\tau$. If instead the firm were to spend the same amount net of tax compensating the employee with equity, and this equity is valued for tax purposes at v per dollar of equity, then the employee would receive $(1-\tau)/(1-v\tau)$ dollars worth of equity before personal taxes. The employee would value each dollar's worth of shares at a dollar, however, only if these shares received the same tax treatment as shares purchased directly from the firm. When a dollar's worth of shares are received as compensation, however, the individual immediately owes taxes of vt. Also, rather than having a basis of a dollar, his basis is instead v. If the acquired shares will be sold T+n years later, this implies extra capital gains taxes in the future equal to $(1-v)g_n e^{-d(T+n)}$. Therefore, the employee would value the equity compensation at

$$\frac{1-\tau}{1-v\tau}\left[1-vt-(1-v)g_n e^{-d(T+n)}\right].$$

The gain to the employee from equity compensation relative to a dollar of wage compensation that costs the firm the same amount can then be shown to equal

$$\frac{(1-v)\left(t-\tau-g_n(1-\tau)e^{-d(T+n)}\right)}{1-v\tau}.$$

If g_n is small, then as with qualified stock options, the relative value of equity compensation compared with wage compensation depends simply on $(t-\tau)$.

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