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VENTURE CAPITAL AND CAPITAL GAINS TAXATION

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The need to encourage venture capital is often adduced as an important justification for reducing the capital gains tax rate. For example, Norman Ture writes that

For both outside investors and entrepreneurs [in new businesses] the reward sought is primarily an increase in the value of the equity investment. For outside investors in particular, it is important to be able to realize the appreciated capital and to transfer it into promising new ventures. Raising the tax on capital gains blunts the inducement for undertaking these ventures.[1]

This paper investigates the links between capital gains taxation and the amount of venture capital activity. It provides a framework for analyzing the channels through which tax policy affects start-up firms.

The first section presents time-series data on venture capital investment in the United States. Beyond the well-known observation that venture investment increased in the early 1980s, perhaps coincidentally after the capital gains tax reduction of 1978, this section compares the growth rate of venture capital activity in the United States, Britain, and Canada. The U.S. venture industry expanded much more quickly than

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[1] *Wall Street Journal*, 8 September 1988, p. 30.

those of the other nations during the early 1980s, but its growth has been slower since the 1986 Tax Reform Act raised the tax rate on capital gains.

There are two potential links between capital gains taxation and start-up firm activity. The first focuses on the supply of venture funds and on the tax treatment of venture investors, while the second highlights the impact of tax policy on the behavior of entrepreneurs. This paper considers each aspect in turn. The second section investigates how taxation affects the supply of venture funds. It shows that fewer than half of venture investors face individual capital gains tax liability on their gains from venture investment. Moreover, only about 10 percent of the investors in organized venture capital partnerships are individuals. Funds committed by untaxed investors have expanded most rapidly in the years following 1978. A significant fraction of the funds supplied to venture firms should therefore be unaffected by the individual capital gains tax.

Section three examines the other channel through which capital gains taxes could affect start-up firms: the incentives of entrepreneurs. This section argues that the effective capital gains tax rate is below the statutory rate because investors and entrepreneurs can defer realizing their gains. For individuals who forgo wage and salary income and accept compensation through corporate stock and related gain-producing instruments, the individual tax burden on capital gains may have important incentive effects.

While the first three sections consider the influence of taxation on venture capital, section four considers the importance of venture capital in the flow of realized gains. Less than one-third of reported gains are the result of appreciation of corporate equity. Only a small fraction of these gains are related to venture capital investments, underscoring the substantial benefits to sectors other than new business that would be provided by an across-the-board capital gains tax cut. While the paper draws no conclusions about the ultimate need for subsidies to venture capital, it emphasizes that reducing the tax rate on all gains is a relatively blunt device for encouraging venture investment.

1. CAPITAL GAINS TAXES AND VENTURE CAPITAL: IS THERE A LINK?

The link between capital gains taxation and venture capital activity is often supported by citing the rapid growth of venture financing after the 1978 and 1981 reductions in capital gains tax rates. Table 1 shows the net commitment of venture capital funds during the period 1969–1987, measured in 1987 dollars. The level of venture funding increased significantly

TABLE 1
Supply of Venture Capital Financing, 1969–1987

Year	Net new commitments to venture capital firms (millions of 1987 dollars)	Maximum personal tax rate on capital gains
1969	505.7	.275
1970	271.8	.302
1971	251.8	.325
1972	156.9	.350
1973	133.2	.350
1974	124.2	.350
1975	19.8	.350
1976	93.3	.350
1977	68.2	.350
1978	978.1	.338
1979	449.2	.280
1980	961.4	.280
1981	1,627.8	.237
1982	2,118.6	.200
1983	5,097.7	.200
1984	4,590.0	.200
1985	3,502.3	.200
1986	4,650.1	.200
1987	4,900.0	.280
1988	—	.280

Source: Column 1, Venture Economics, *Venture Capital Yearbook, 1988,* p. 17. Column 2, U.S. Treasury (1985), p. 37, updated by the author.

after each tax reform, from an average of $380 million in 1976–1978 to $1.01 billion in 1979–1981 and $3.93 billion in 1982–1984. The data also suggest some reduction in venture capital funding between 1969 and subsequent years, coincident with the 1969 capital gains tax increase, although adequate pre-1969 data are not available.

Since the Tax Reform Act of 1986, which raised individual capital gains tax rates from 20 percent to 28 percent (or in some cases to 33 percent), venture funding has been stable. Total venture commitments increased 6 percent between 1986 and 1987, and preliminary 1988 data suggest that this level has at least been maintained through 1988.[2] The recent growth of venture capital investment in other nations, however, suggests that the post–1986 U.S. performance may reflect a negative effect of tax reform. In the U.K., the flow of venture capital commitments nearly doubled between 1986 and 1987. In Canada, venture funding rose even

[2] *Venture Capital Journal,* July 1988, p. 13.

more dramatically, from $209 to $800 million.[3] While the growth of venture capital in Canada and Britain may in part reflect the maturation of their venture capital industries, it provides a useful contrast to the recent U.S. experience.

The inverse correlation between capital gains tax rates and venture capital funding in the U.S. is not conclusive evidence of a link between the two. A variety of other factors, particularly the Department of Labor's 1978 decision to relax the "Prudent Man Rule" that had previously obstructed pension fund investment in high-risk start-up ventures, could also account for some of the variation in venture capital activity.[4] The Canadian experience during the last decade provides an informative control for evaluating the influence of capital gains tax reductions on venture capital. In the decade between 1976 and 1986, the stock of commitments to the U.S. venture capital industry rose at a compound annual rate of 17.1 percent. Measured in constant dollars, the pool of venture capital funds in 1986 was 4.85 times as large as the pool one decade earlier. In Canada, by comparison, the annual growth rate of venture funds was only 5.7 percent, so that in 1986 the pool of funds was 1.75 times as large as in 1976. While international comparisons are difficult because of problems in controlling for institutional differences, the finding that venture capital investment grew more rapidly in the United States, the country that reduced its capital gains tax rate, is further supporting evidence for a potential link between capital gains taxation and venture capital.

Capital gains tax rates and venture capital could be linked in either or both of two ways. First, reductions in capital gains taxes could raise the *supply* of venture capital funds by raising the aftertax returns from investing in assets that yield capital gains rather than dividends or interest income. This view implicitly assumes that taxable individuals supply a substantial share of the funds committed to venture capital. Second, reductions in capital gains taxes could increase the *demand* for venture capital funds by raising the number of entrepreneurs who decide to start new firms, and making it easier for these managers to attract employees.

[3] *Venture Capital Journal*, August 1988, p. 10, and data provided by Venture Economics Canada. Anecdotal evidence suggests some qualitative changes in the U.S. venture capital industry since 1986. Schrage (1988) reports that domestic venture capital funds are focusing more on late-stage "mezzanine" financing and less on start-up financing than in previous years. Foreign investors are apparently providing a growing share of start-up funding.

[4] The rise of start-up firms is also in part attributable to changes in technological opportunities, which induced some changes in the industrial mix of the U.S. economy. The Congressional Budget Office (1985) has argued that the growth of several high-technology industries can be explained this way and that the growth of these industries had begun before the capital gains tax reduction of 1978.

The next two sections address each of these issues in turn, assessing where possible the quantitative importance of taxation for the level of venture capital activity.

2. CAPITAL GAINS TAXATION AND THE SUPPLY OF VENTURE CAPITAL FUNDS

Probably the most common account of the link between taxation and venture capital activity focuses on the investors who supply funds to start-up firms. If these investors are individuals, as opposed to institutional investors such as pension funds or universities, then changes in the capital gains tax rate may affect the relative return on venture investments and on more traditional investments such as bonds. To assess the potential importance of capital gains tax changes, this section considers the source of funds for start-up enterprises.

Start-up firms receive capital from many sources. The corporate founder and other employees and affiliates contribute capital, much of this in the form of equity that is ultimately subject to individual capital gains taxation. Unfortunately, there is little systematic evidence on the financial structure of new firms. Table 2 presents evidence from a somewhat dated study on the debt, equity, and ownership structure of start-up enterprises. In 1976, organized venture capitalists accounted for less than 15 percent of total funding, although their share has undoubtedly grown in subsequent years. By comparison, for technology-based firms,

TABLE 2:
Capital Structure of Start-Up Enterprises

Capital/Type and Source	*Share of Capital Structure (percent)*	
	Technology-based firms	Other firms
Equity—Insiders	13.6	16.4
Equity—Unaffiliated individuals	11.3	4.3
Equity—Venture capitalists	9.8	5.1
Equity—Other investors	19.1	3.9
Debt—Insiders	2.2	6.9
Debt—Unaffiliated individuals	4.0	3.5
Debt—Venture capitalists	2.5	1.8
Debt—Banks	19.5	28.0
Debt—Other investors	18.0	30.1

Notes: The "Other investors" category includes investors who could not be identified, but who may have in fact been in other categories.

Source: Charles River Associates, *An Analysis of Venture Capital Market Imperfections*, as cited in U.S. Treasury (1985).

insiders and unaffiliated individuals supplied 24.9 percent of the initial capital as equity. Approximately 54 percent of the funds for these small firms was supplied as equity. For nontechnology firms, the equity share was 29.7 percent, with insiders and other individuals supplying 20.7 percent of the total capitalization. Venture capitalists accounted for only one-sixth of the total equity flow. The importance of organized venture capital has almost surely grown since this survey, as the industry's resources have expanded rapidly. Freear and Wetzel (1988) study equity financing for technology-based start-up firms headquartered in New England during the 1975–1986 period. Their results show that private individuals supplied 21% of the equity to their sample firms, while organized venture capital firms provided the remaining 79%. Clear patterns also emerged in the time profile of financing, with individuals playing a more important role in the early stages of venture financing. These data suggest that a significant fraction of the funds for start-up firms is provided through informal channels, from initial participants in the firm. The precise magnitude of this source of capital remains unclear, however. Nevertheless, most of the investors providing capital through informal channels probably face capital gains tax liability on their returns.

The rapid growth in organized venture capital funding after the 1978 capital gains tax cuts has been widely cited as demonstrating the sensitivity of start-up ventures to tax policy. Organized venture capital consists of three classes of institutions: independent venture capital funds, Small Business Investment Companies (SBICs), and corporate subsidiaries. Independent venture funds are typically limited partnerships. They consist of a general partner or partners, who screen potential investments and assist the management teams of firms the partnership has invested in, as well as limited partners, who provide financial capital. Perez (1986) reports that a typical venture partnership has a lifetime of between seven and ten years and provides general partners with a fee (2 or 3 percent of the partnership's initial capitalization) as well as a share (often 20 percent) of the profits.

Small Business Investment Companies are licensed and regulated by the Small Business Administration (SBA). They are essentially closed-end investment trusts that provide both capital and managerial assistance to start-up firms. The 1958 legislation authorizing SBICs allowed these entities to borrow three dollars from the SBA at Treasury interest rates for each dollar of equity capital they raised.[5] Because the investment income of SBICs is not taxable until it is distributed to sharehold-

[5] Limits on the SBA's budget during the 1980s have reduced actual matching to well below the theoretical maximum and have induced long queues for SBA funding.

TABLE 3
Composition of Venture Capital Funding Pool, 1977–1987

					Total from:		
	Total	Private independent venture funds	SBICs	Corporate subsidiaries	Individual investors	Untaxed investors	Others
1977	4408	1551	1070	1787	776	466	3166
1980	6180	2472	1923	1785	1102	1054	4024
1981	6262	3256	2003	2003	1352	1434	3476
1982	8945	5179	1530	2236	1698	2093	5154
1983	13,707	9289	1586	2832	2507	3595	7605
1984	17,822	12,896	1790	3136	3032	4994	9262
1985	20,774	15,091	2053	3630	3349	5994	11,431
1986	24,945	18,714	2160	4071	3758	7904	13,283
1987	29,020	22,750	2310	3960	4262	9962	14,976

Source: Venture Capital Journal, various issues. Entries are measured in millions of 1987 dollars.

ers, SBICs provide an attractive investment vehicle for investors such as banks and insurance companies who wish to defer taxable income. Many SBICs have outstanding liabilities, such as debt to the SBA, and as a result their investment in new firms often takes the form of convertible debt rather than equity. Individuals may invest through SBICs, but they have not been primary suppliers of capital through this channel.

The final investment channel, corporate subsidiaries, provides a mechanism for large corporations to become involved in developments at start-up firms. These subsidiaries, such as Exxon Enterprises and Gevenco (General Electric), are often designed to provide diversification or innovation to their corporate parent. Venture capital investments through corporate subsidiaries face corporate tax rates, so they should be much less sensitive to changes in the individual income tax treatment of capital gains than investments through independent venture partnerships.[6]

Table 3 presents information on the stock of capital in the venture capital industry during the last decade. At the end of 1987, the total capitalization of the venture industry was $29 billion, with almost $23 billion of the total supplied through independent venture partnerships. Commitments to such partnerships have increased fifteenfold during the last decade, while funds channeled through SBICs and corporate subsidiaries have increased approximately one-and-one-half times. These num-

[6] Changes in the capital gains tax rate may affect the cost of capital of the parent firm, thereby altering the horizon over which it plans investments and affecting the resources allocated to venture subsidiaries.

TABLE 4
Venture Capital Supplied to Private Independent Funds, 1979–1987

	Pension funds	Individuals	Insurance companies	Foreign investors	Corporations	Nonprofit institutions
			Real value of funds committed ($1987 million)			
1978	52.8	112.7	56.3	59.9	35.2	31.7
1979	78.9	58.6	10.2	38.2	40.7	25.5
1980	263.3	154.3	118.0	72.6	163.4	136.2
1981	249.7	249.7	162.8	108.6	184.6	130.3
1982	543.8	346.0	230.7	214.2	197.7	115.3
1983	1194.0	808.8	462.2	616.3	462.2	308.1
1984	1189.0	524.6	454.6	629.5	489.6	209.8
1985	805.5	317.3	268.5	561.4	292.9	195.3
1986	1705.0	409.2	341.0	375.1	375.1	204.6
1987	1638.0	504.0	630.0	546.0	462.0	420.0
			Percentage of total commitments			
1978	15	32	16	17	10	9
1979	31	23	4	15	16	10
1980	29	17	13	8	18	15
1981	23	23	15	10	17	12
1982	33	21	14	13	12	7
1983	31	21	12	16	12	8
1984	34	15	13	18	14	6
1985	33	13	11	23	12	8
1986	50	12	10	11	11	6
1987	39	12	15	13	11	10

Source: Venture Economics, *Venture capital yearbook 1988*, and previous issues of *Venture capital journal*.

bers understate the amount of funds supplied to new firms, since they ignore funds provided through the informal sector (for example, from the firm's founder).

While individual investors are important suppliers of capital to the independent venture funds (IVFs), they account for less than half of the investments through this channel. Table 4 presents data on the flow of new commitments to these independent funds for each of the last ten years. In 1987, individual investors supplied only 12 percent of the new funds to independent venture capital partnerships. Untaxed pension funds and foundations accounted for 49 percent of the IVFs. This is slightly smaller than their 56 percent share in 1986 and notably higher than their combined 24 percent share in 1978. Another 26 percent of the funding for IVFs in 1987 came from corporations, including both insurance companies (15 percent) and other large corporations (11 percent). Finally, 13 percent of venture capital funding in 1987 was supplied by

foreign investors, who are not affected by the individual capital gains tax.

The finding that 88 percent of the funding for independent venture funds arises from investors who are not affected by the personal income tax casts doubt on the supply-of-funds view of how the capital gains tax affects venture investment, especially in organized venture capital.[7] The last three columns of Table 3 present summary statistics on the fractions of the venture capital pool that can be traced to different classes of investors.[8] Individual investors accounted for 14.7 percent of the stock of venture capital funds at the end of 1987, while 34.3 percent was provided by investors who faced no tax liability—pension funds or nonprofit institutions. The individual investor category is a subset of the IVF category, as is the untaxed investor category. Investors facing "other" tax regimes include those facing the corporation tax in the U.S. as well as those who are taxed in foreign countries. These investors provided the balance of the funds to venture start-ups.

These data imply that if the 1978 capital gains tax reduction had never been enacted and individual investment in IVFs had remained constant in real terms at its 1977 level, the venture capital industry in 1987 would have been only 12 percent smaller than it actually was. These calculations err on the side of overstating the impact of the capital gains tax on the organized venture capital industry, since some investors allocated funds from Keogh plans, IRAs, or other tax-favored vehicles to venture investments.

The data in Table 4 are inconsistent with the view that rapid growth in venture capital funding was due to increased investment by taxable individuals. Between 1978 and 1979, the pension fund share of new commitments to IVFs increased from 15 to 31 percent, and it has remained at roughly this level for the last nine years. As a result, between 1978 and 1987, when the annual flow of venture funding increased by a factor of five, pension fund investments increased by a factor of thirteen. Investment by individuals and families increased by a factor of less than two. Since most other investor categories maintained their share of the venture funding pool over this period, their contributions increased approximately fivefold. During the early 1980s, when historically low capi-

[7] An alternative explanation, suggested to me by Henry Aaron, is that the level of individual investment in venture capital is low precisely *because* of capital gains taxes.

[8] These calculations assume that half of all investment in IVFs at the end of 1977 had been contributed by individuals. This is substantially larger than the flow investment share of individuals at the end of the 1970s and is designed to be a conservative (that is, large) estimate of their importance.

tal gains tax rates should have made individual investment in venture projects especially attractive, venture investments by individuals did not keep pace with those of investors who did not face similar tax incentives.

The preceding analysis has focused on capital supplied to firms in the first few years of their existence. Even if individual investors do not play a central role in this stage of the venture capital process, one might still argue that they are important, because they support the market for initial public offerings by start-up firms. Empirical evidence on the ownership of traded equity in newly traded firms is, unfortunately, unavailable.[9]

The results in this section suggest serious difficulties with the argument that the organized venture capital industry has grown in the last decade because of reduced taxes on the investing public. While some venture investors are affected by the individual capital gains tax, the rapid growth of independent venture partnerships was not driven by an expanded supply of funds from individual investors.

3. THE DEMAND FOR VENTURE CAPITAL FUNDING: INCENTIVES FOR ENTREPRENEURS

The second potential link between capital gains tax rates and the level of venture capital activity operates through the *demand* for venture capital funds. This channel involves the occupational decisions of potential entrepreneurs. These individuals can work as middle- or high-level managers for large firms, or they can start their own firms in a senior management position.[10] Most of the compensation received by middle managers in large firms is wage income, while much of the compensation in small start-up enterprises is likely to be taxed as capital gains. By altering the relative tax burdens on wage and capital gains income, reductions in the capital gains tax make entrepreneurship more attractive and therefore raise the demand for venture funds.[11]

[9] The effective capital gains tax burden on stock market investors is a subject of some controversy. Stiglitz (1983) discusses a number of strategies that individual investors could use to reduce their taxes or even to convert the tax to a subsidy. Poterba (1987) provides empirical evidence suggesting only a small fraction of investors take advantage of these trading strategies.

[10] The arguments of this section apply both to the founder, the individual who raises capital and becomes the CEO of the new firm, and to top-level employees who receive a large fraction of their compensation in the form of stock options or other equity claims.

[11] This view implies that a key determinant of venture capital activity should be the ratio of (1-z), the aftertax income from a dollar of capital gains, to $(1-t_w)$, the marginal tax rate on wage and salary income. This differs from the view that the supply of venture capital is affected by capital gains taxes, since it predicts that the ratio of $(1-\tau_{int})$, the aftertax income from portfolio assets such as bonds, and (1-z) should be central for the supply of venture funds.

The principal objection to the demand-side link between capital gains taxes and venture capital involves the divergence between the statutory tax rate on realized gains and the effective tax rate on accruing gains. Because gains are often realized many years after they accrue, and taxes are due only on realization, the government in effect provides investors with interest-free loans on unrealized gains.[12] The effective burden of the capital gains tax therefore depends on the length of time a gain is held *without* realization. Particularly for assets held for long periods of time, the effective tax rate may be far less than the statutory rate. This underscores the importance of obtaining information on the time horizon over which corporate founders and early employees realize their accrued gains. This section presents illustrative calculations suggesting that the response of the *effective* tax rate to changes in the statutory capital gains tax rate is less than point-for-point. For holding periods of five to eight years, the effective rate may be two-thirds of the statutory rate.

3.1 The Venture Capital Timetable

To calibrate the holding periods that are likely to be important for start-up firms, Figure 1 describes the stylized growth process for a new firm.[13] Initial infusions of capital from insiders, venture capitalists, and banks can occur in the start-up as well as the early growth stages. In 1985, 45 percent of disbursements from independent venture capital funds was to firms in the start-up or pre-start-up stages, with another 26 percent to firms in the early growth stage and approximately 15 percent to firms experiencing accelerating growth.

Investments by venture capitalists can follow a number of different trajectories. Roughly one start-up in five becomes successful enough to warrant a public offering of equity; two in five are ultimately merged into larger firms; one in five becomes a successful small business, with the venture capitalists selling their equity stake to the managers; and one in five must be liquidated or written off (Perez, 1986). For venture investors, the elapsed time between their initial investment and their disposition of the firm is between three and five years. Data on average holding periods, by type of termination, for a sample of 433 start-up firms analyzed by Venture Economics are shown below:

[12] Alan Auerbach (1988) discusses the impact of holding periods on effective tax burdens and provides a novel suggestion on how to implement accrual taxation while taxing only realized gains.

[13] This diagram is drawn from Perez (1986), p. 123.

Type of termination	Average holding period	Average return
Initial public offering	4.2 years	610 percent
Acquisition by another firm	3.7 years	70 percent
Company buy-back	4.7 years	110 percent
Write-off	3.7 years	−100 percent

Using the rough proportions suggested above for these outcomes, the average annual return to venture investments in this sample is more than 20 percent per year. This may be an unusual period, since it was marked by strong economic growth and a rapid rise in the stock market, but that cannot be evaluated.

The relatively short investment horizons of venture projects suggest that investors are unlikely to receive substantial benefits from deferring capital gains. A similar argument applies to other employees who forgo wage income to work for a start-up firm: they are likely to realize at least part of their gains soon after the firm goes public, to finance consumption or to repay debts. Even corporate founders may not have lifetime horizons; in many cases, the entrepreneur proves more adept at starting than at managing a growing firm, and he or she leaves the firm shortly after it reaches the "stable growth" phase.

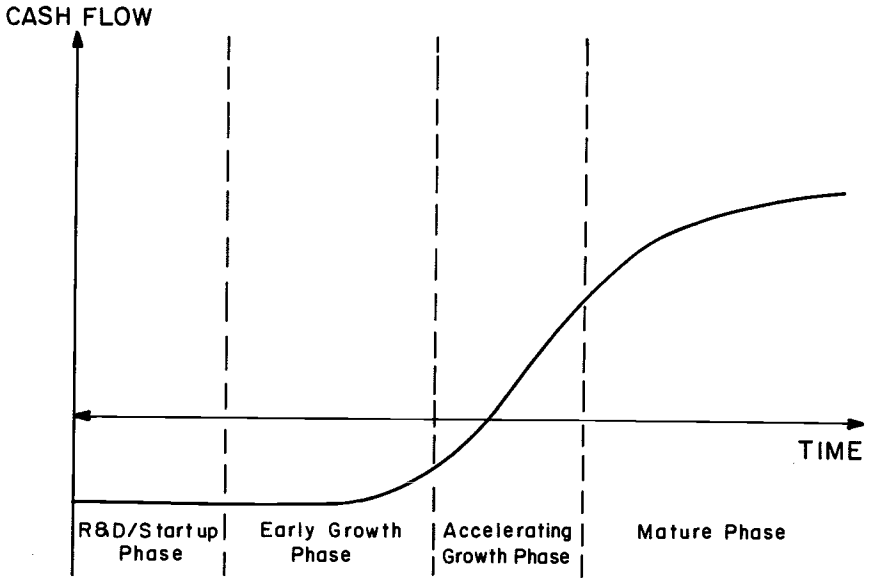

FIGURE 1. *Time Profile of Venture Capital Project*

3.2 *Effective Capital Gains Tax Burdens*

The difference between statutory and effective rates of capital gains tax can be formalized by assuming that an asset appreciates at a constant nominal rate $g + \pi$, where g denotes the real growth rate and π is the inflation rate. Realized gains are taxed at a statutory rate τ_g, and T denotes the investor's holding period. The aftertax wealth of an investor who allocates one dollar to this asset in period zero and realizes his gain T years later is

$$W_{\text{realization}} = e^{(g+\pi)T} - \tau_g(e^{(g+\pi)T} - 1) = \tau_g + (1-\tau_g)e^{(g+\pi)T}. \quad (1)$$

By comparison, if the asset's nominal return each year had been taxed *on accrual* at rate τ_a, then the investor's wealth in period T would be

$$W_{\text{accrual}} = e^{(g+\pi)(1-\tau_a)T}. \quad (2)$$

The rate of accrual taxation τ_a^* that yields the same year $= T$ wealth as a tax at rate τ_g on realizations can be found by equating (1) and (2):

$$\tau_a^* = 1 - [1/(g+\pi)T] * ln[\tau_g + (1-\tau_g)e^{(g+\pi)T}]. \quad (3)$$

Table 5 presents estimates of the effective accrual tax rate, τ_a^*, for a variety of different holding periods and asset returns. Each case assumes that the statutory tax rate on realizations is 28 percent. The entries show

TABLE 5
Effective Nominal Accrual Capital Gains Tax Rates

Appreciation rate	*Holding period*			
	5 years	10 years	20 years	40 years
	Inflation Rate = zero			
$g = .05$	.256	.233	.195	.139
$g = .10$	.233	.195	.139	.080
$g = .15$	.213	.164	.103	.055
$g = .20$	.195	.139	.080	.041
	Inflation Rate = 8 percent			
$g = .05$	.221	.175	.115	.063
$g = .10$	.202	.148	.088	.046
$g = .15$	.185	.126	.071	.036
$g = .20$	.169	.109	.058	.029

Source: Author's calculations assuming statutory tax rate of .28 on realizations.

that for holding periods of longer than twenty years, the effective accrual rate is less than half of the statutory rate. For a five-year horizon, the effective accrual rate is nearly five percentage points lower than the statutory rate, but it still constitutes a significant tax burden. For entrepreneurs who intend to maintain their positions for periods of twenty to forty years, the 1986 increase in the capital gains tax rate alters the *effective* tax rate by less than three percentage points. For those who plan to realize gains in five years, however, the effective tax rate rises by more than five percentage points.

The accrual tax rates in Table 5 equate the nominal returns under realization and accrual taxation. This ignores the important effect of taxing *nominal* gains on the investor's *real* return. If real gains were taxed at rate τ_a, then the investor's wealth in year T would be

$$W_{\text{accrual,real}} = e^{(g(1-\tau_a)+\pi)T}. \tag{4}$$

Equating (4) and (1) defines the rate of accrual taxation on real returns that corresponds to a given tax on nominal realizations.

Table 6 presents estimates of τ_a^* assuming inflation rates of 4 and 8 percent per year, and shows that effective tax rates exceed the statutory rate in many cases. When the inflation rate is 8 percent per year, an asset yielding a 5 percent real return faces a real tax rate of 57.5 percent if the

TABLE 6
Effective Real Accrual Capital Gains Tax Rates

Appreciation rate	Holding period				Real tax on debt
	5 years	10 years	20 years	40 years	
	Inflation Rate = 4 percent				
$g = .05$	.428	.363	.266	.159	.504
$g = .10$	.304	.237	.153	.082	.392
$g = .15$	.251	.181	.107	.055	.355
$g = .20$	.218	.147	.081	.041	.336
	Inflation Rate = 8 percent				
$g = .05$	.575	.456	.300	.163	.728
$g = .10$	.363	.266	.159	.082	.504
$g = .15$	.283	.194	.108	.055	.429
$g = .20$	.237	.153	.082	.041	.392

Source: Author's calculations assuming statutory tax rate of .28 on realizations. These calculations indicate the percentage reduction in the real return as a result of taxing accrued nominal gains at realization. The real tax on debt, in the last column, is the effective tax rate on real interest payments for the given inflation rate, assuming g equals the real interest rate and that nominal interest rates rise one-for-one with inflation.

gain is realized in five years, and 30 percent if the asset is held as long as twenty years. If the appreciating asset has a higher real return, the inflation-induced increase in effective tax rates is smaller. For an asset with a 15 percent real return and a five-year holding period, the effective real tax rate is 28.3 percent if inflation is 8 percent, and 25.1 percent if inflation is 4 percent per year. Even with the benefits provided by tax deferral, the *real* effective tax rate is near the statutory tax rate when the inflation rate is substantial.

The high effective tax burden in inflationary times is not unique to the capital gains tax, other types of capital income are also taxed heavily. Consider a bond that pays a real interest rate r and a nominal rate $i = r + \pi$, with nominal interest income taxed at rate θ. The real aftertax return is $(1-\theta)r - \theta\pi$, so the effective real tax rate is $\tau_r = \theta(1+\pi/r)$. The last column in Table 6 reports this effective tax burden for projects with different pretax returns. The effective tax rates on interest-paying investments are substantially higher than those on assets that yield capital gains. For investors in gain-producing venture partnerships, inflation tends to reinforce the relative attractiveness of obtaining capital gains rather than ordinary income. For entrepreneurs thinking about forgoing wage and salary income to earn capital gains on a start-up firm, however, the inflation-induced elevation of capital gains tax rates is a serious concern.

The effective burden of the capital gains tax is compounded by another feature of the federal income tax: the provision of imperfect loss-offsets. If an entrepreneur is part of a successful venture, the government will tax his or her gains. If the venture fails and the individual's initial investment becomes worthless, however, the entrepreneur can only deduct $3000 of losses per year from taxable income. The tax system therefore lowers the mean return the entrepreneur expects on an investment in the start-up firm. Given the high probability of losses in the venture industry, the absence of perfect loss-offset may have a pronounced effect in raising effective tax rates.

The foregoing calculations suggest that the capital gains tax affects the relevant trade-off between wage and nonwage income for potential entrepreneurs. It affects the same choice for potential employees of start-up firms, many of whom receive corporate stock rather than wages for part of their compensation. For an entrepreneur who expects a 15 percent real return each year on an investment and who plans to realize those gains ten years after his or her firm starts business, an increase in the statutory tax rate from 20 to 28 percent changes the effective tax rate by approximately 4 percent.[14] These calculations suggest that changes in

[14] This calculation assumes a 4 percent inflation rate.

the capital gains tax may have incentive effects on potential entrepreneurs. They also argue for focusing on the difference between tax rates on labor income and those on capital gains to calibrate the tax system's impact on the venture industry.

3.3 Qualifications Regarding Entrepreneurial Tax Burdens

The foregoing calculations ignore two aspects of the effective capital gains tax burden and hence of the differential tax burdens on wages versus other types of income. The first is step-up of basis at death. If an investor dies and bequeaths an asset with an accrued gain, the heir is not liable for capital gains tax. This provision of the tax code may be especially important for individuals who consider starting their own companies. A typical life-cycle scenario for such individuals might be starting the firm, subsequently managing the firm as CEO, eventually retiring while still holding a significant equity stake and remaining an important force on the board of directors, and finally dying and leaving an important equity claim to heirs. The effective capital gains tax for this scenario is zero, regardless of the asset growth rate.[15]

Second, the implicit argument underlying the calculation of capital gains tax rates for entrepreneurs is that their choice is between salary income in a large firm and capital gains income in a start-up. This overstates the difference between the two types of employment, since some high-level managers in large firms receive at least part of their compensation in the form of stock options or other tax-favored instruments. The 1987 Arthur Young *Survey of executive compensation* reveals that approximately one-third of senior managers in large (top 1000) U.S. firms receive nonqualified stock options, a similar fraction are eligible to receive incentive stock options, and approximately one in ten receives stock appreciation rights. Over 40 percent of these managers, however, are employed by firms with no organized accumulation plans to provide employees with tax-sheltered income.

If tax considerations were paramount issues in workers' evaluation of compensation packages, one would expect large firms to attempt to structure their payment systems for middle managers to provide capital gains. The relatively limited use of such plans is probably the result of nontax considerations involving risk-sharing and agency problems. The return on most of the instruments that provide income as capital gains, such as stock options, is linked to firm performance. An employee who exchanges the certainty of wage compensation for an equal amount of

[15] It is difficult to gauge the fraction of accrued gains that escapes taxation because of basis step-up at death. The Congressional Budget Office (1988b) estimates that the annual loss from net gains that are transferred at death is approximately $17 billion.

expected capital gain income therefore bears some risk associated with the firm's performance. For a top executive in a small firm, whose behavior may affect the level of share prices, the risk of share price movements beyond his control is therefore smaller. Small firms may therefore be able to provide a higher share of compensation as capital gains.

Despite these limitations, changes in the capital gains tax rate may have an important effect on the supply of entrepreneurs and employees available for venture capital funding. This link between tax policy and venture capital seems more plausible than one focused on the supply of venture funds.

4. THE SMALL WORLD OF VENTURE CAPITAL

Reductions in the capital gains tax are likely to raise the attractiveness of undertaking venture investments for some investors and for entrepreneurs. Informed debate on such proposals must recognize that an across-the-board cut in capital gains tax rates, however, is a relatively blunt instrument for stimulating venture activity. Most of the benefits of such a tax reduction would accrue to investors in assets other than venture capital firms.

The diverse asset mix of realized capital gains is illustrated in Table 7, which reports the asset composition of net capital gains in the three years since 1970 for which the IRS reports detailed data. Less than one-quarter of realized capital gains reflects appreciation of common stock, and venture capital activity is only a small share of this equity component. Equities account for a somewhat higher share of taxable gains—roughly one-third in 1981—because a substantial share of realized gains is untaxed gains on personal residences. Real property, both real estate and other assets such as business equipment, account for a larger share of net gains than does common stock in each of the survey years. The mix of gains varies across survey years in part because ex post appreciation rates on different assets are not constant through time. In all of the years, however, common stocks are the largest category of gain-producing assets, but they constitute a small share of total taxable gains.[16]

The asset mix of realized gains largely reflects the asset composition of

[16] Data on the composition of realized gains for 1985 and 1986 are not yet available. They may show a significant increase in the share of gains due to corporate equities. The explosive increase in capital gain realizations in 1986 was largely the result of pre-announced changes in the statutory tax rate (see Auerbach, 1988). Since it is easier to manipulate the timing of capital gains on corporate stock than on many other assets, a particularly high fraction of the gains realized for tax-timing reasons may be on equities.

TABLE 7
Asset Composition of Realized Capital Gains

	1973	1977	1981
	A. Shares of total realized gains		
Common stock	14.8	14.7	24.8
Other securities	−0.8	0.5	−1.8
Sales of partnerships	7.9	9.2	6.7
Nonresidential real estate	11.1	9.5	14.8
Capital gain distributions	3.1	2.3	1.4
Farms and timber	1.7	2.2	3.4
Depreciable assets	12.5	17.7	11.4
Personal residences	15.5	14.9	25.3
Installment sales	14.0	8.5	8.1
Other assets	20.3	20.5	5.9
	B. Shares of realized taxable gains		
Common stock	17.5	17.2	33.2
Other securities	−0.9	0.6	−2.4
Sales of partnerships	9.3	10.8	9.0
Nonresidential real estate	13.1	11.2	19.8
Capital gain distributions	3.6	2.7	1.9
Farms and timber	2.0	2.6	4.5
Depreciable assets	14.8	20.8	15.2
Installment sales	16.6	10.0	10.8
Other assets	24.0	24.1	8.0

Calculations are based on U.S. Treasury (1980), Brame and Gilmour (1982), and Clark and Paris (1985). Depreciable property includes sale and involuntary conversion of depreciable business and nonbusiness assets, as well as other Section 1231 property. The calculations for taxable gains treat gains on personal residences as untaxed.

household portfolios. Households held $2.2 trillion of corporate equities at the end of 1987, roughly the same amount as their holdings of investment real estate ($2.1 trillion) and twice their holdings of corporate and government bonds ($1.1 trillion). Owner-occupied real estate accounts for over $4 trillion of asset holdings. The appreciation rates over the last two decades indicate that real estate has yielded larger capital gains than common stock. While some of the observed gains during the last two decades reflect relative price changes that may not occur again, there is little reason to expect the capital-gains-weighted role of corporate equities to rise significantly in the future.

The pool of venture capital funds under management in 1987 totaled approximately $29 billion, or less than 1 percent of the value of U.S.

equity markets.[17] This suggests the relatively small share of venture-related gains in total realizations. The flow of initial public offerings (IPOs) of new firms suggests a similar conclusion. In 1987, for example, the aggregate flow of IPOs totaled $24.2 billion.[18] The value of venture-backed IPOs is estimated at $1.8 billion (*Venture Economics*, 1988). Even if all the proceeds of the venture-backed sales were gains to taxable investors, the resulting capital gains tax liability could not have exceeded $520 million. The actual tax liability was probably far smaller, less than $350 million, since over 40 percent of the venture capital pool is supplied by untaxed investors. Similar calculations for 1985 and 1986, years for which the total flow of realized gains is known, indicate the venture-backed IPOs accounted for 0.5 percent and 0.65 percent, respectively, of realized gains.[19] Even the *total* flow of initial public offerings, $22.4 billion in 1986, is small relative to the more than $320 billion of realized gains. These statistics illustrate the basic point that a subsidy to all appreciating assets, such as an across-the-board reduction in capital gains rates, largely benefits nonventure capital assets.

5. CONCLUSIONS

The previous sections do not estimate the sensitivity of either the supply of or demand for venture capital funding with respect to capital gains tax rates. Nevertheless, they attempt to provide a framework for understanding the links between capital gains taxation and venture capital. Since reductions in the capital gains tax rate raise the attractiveness of venture capital projects for some investors and for potential entrepreneurs, such reductions are likely to exert some positive effect on the level of venture activity. But the foregoing analysis does suggest that naive arguments based on the assumption that all investors and all entrepreneurs are taxed at the statutory capital gains rate are inappropriate. At most, half of the seed money to finance start-up firms is provided by investors who face the individual income tax treatment of capital gains. Moreover, a five-percentage-point change in the statutory tax rate

[17] Most of the venture capital funds are not invested in the stock market. The relative magnitude of the stock market and the venture capital industry illustrates the general principle that this industry is small in comparison to the pool of assets generating capital gains.

[18] *Going Public: The IPO Reporter* 12 (January 1988), p. 1.

[19] Even assuming that venture investors outside the organized venture industry market are five times more numerous than those in the industry, as Table 2 suggests, only 3 percent of realized gains are related to venture capital.

on realized gains implies roughly a three-percentage-point change in the effective tax rate for the entrepreneur.

These data do not resolve the broader question of the opitmal tax rate on capital gains realized in venture investments or the optimal rate on gains more generally. If arguments for unusual social externalities in the venture capital field prove convincing, then policy debate in a deficit-strapped economy will inevitably turn to targeted subsidies that affect only venture investments. Such policies would induce two types of distortions. First, if capital gains on equity in new firms were taxed at a lower rate than gains on established firms, existing firms would face strong incentives to spin off their subsidiaries doing R & D or entering new lines of business. This might result in inefficient organizational structures for some firms. Firms or partnerships engaged in one line of business (say real estate investing) might face strong incentives to branch into other businesses that would enable them to qualify for subsidies that are targeted to new ventures. Second, firms might attempt to reincorporate to take advantage of reduced tax rates for "new" firms. It would be difficult to design tracing rules that would prevent established firms from reconstituting themselves in order to receive more favorable tax treatment.

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