Taxation of Capital Gains Income and Distortion of Individual Investment Choices

Abstract: Recent literature on capital gains taxation has focused on how capital gains taxation affects growth, how it affects firms' financing decisions, and the responsiveness of realizations to tax rates. This paper examines how taxation of capital gains income affects individuals' choice between investments. In the U.S., income given preferential treatment as capital gains results from a combination of price changes due to real economic processes, inflation, and accounting and tax rules that depart from economic reality. U.S. accounting rules do not adjust basis for inflation, and this biases individual choices against assets that pay part or all of their return through appreciation. However, the fact that US accounting and tax rules allow taxpayers to defer recognition of gains and re-characterize some ordinary income as capital gains income biases individual investment choices towards capital gains assets, even without preferential rates.

Introduction

Income from capital gains is given preferential treatment by the IRS code and by many state income tax laws, and policy makers are frequently confronted with proposals to either expand or repeal existing preferences. This paper examines whether preferential treatment for capital gains is justified in terms of improving economic efficiency, particularly in terms of individuals' choices between alternative investments.[1]

A good tax system has a number of desirable characteristics.[2] These include economic neutrality, fairness, and ease of administration and compliance. An economically neutral tax system would not affect taxpayers' decisions, such as how much to work, or how much of income to spend and how much to save. The aspect of economic neutrality that is the main concern of this paper is neutrality between assets that provide a return through a stream of payments, such as dividends or interest payments, and assets that provide a return through appreciation, i.e. capital gains. A neutral tax system will not give taxpayers an incentive to choose one type of investment over the other. As will be seen, it is difficult to tax capital gains in a way that is neutral with respect to investment choices while being fair, easy to administer, and easy to comply with.

The converse is that feasible tax systems tax capital gains in ways that are not economically neutral. This paper examines whether feasible taxation and accounting systems provide favorable, unfavorable, or neutral treatment of capital gains income arising from different sources. In particular, it looks at whether existing rules for measuring capital gains and

[1] This paper does not address more general policy issues relating to income taxation, such as the choice of tax base, the appropriate degree of progressivity, and preferential treatment of savings.
[2] Principles of a High Quality State Revenue System, National Conference of State Legislatures, 2007.

recognizing capital gains income distort investment choices and whether preferential rates or partial exclusions reduce or increase distortions.

Section 1 defines capital gains, which is an economic concept, and capital gains income, which is an accounting concept, and points out the ways the two differ. Section 2 states the well-established rule for economically neutral taxation of capital gains income and explains the difficulties inherent in trying to implement that rule. Section 3 explains the types of economic processes that can produce capital gains and additional processes where tax law and accounting conventions can produce capital gains income even when there are no economic capital gains. Section 4 looks at whether real-world tax laws and accounting rules encourage or discourage investment in assets that yield part or all of their return as capital gains income. Since not all of the results in this section appear to be widely known, there is a mathematical demonstration of each conclusion. Section 5 summarizes and draws conclusions.

Few of the ideas presented here are new. Some of them appear to be well known to economists who specialize in taxation, but few appear to be well known to policy makers. On the other hand, the central question addressed in this paper has received little attention in the literature. Recent research has tended to focus on the revenue effects of rate changes and the effect of capital gains taxes on corporate finance. There are a number of papers dealing with the design of a neutral tax on capital gains, but there has been little systematic work on the consequences of non-neutrality.

1. Capital Gains and Capital Gains Income

Throughout this paper, I will distinguish between capital gains, which is an economic concept, and capital gains income, which is an accounting concept. It is important to make this distinction because economists' rules for neutral taxation of capital gains use the economic concept, while actual tax systems rely on the accounting concept, and the two generally differ.

A capital gain or loss has occurred when the price of an asset has changed over time and the change is not accounted for by the combination of change in the general price level and economic depreciation or economic depletion of the asset. Economic depreciation is the decrease in the value of an asset due to wear and tear and the passage of time. Economic depreciation is most obvious in the case of machinery or other physical capital. When it is used, a machine wears out. Parts are gradually worn away and weakened due to accumulated stresses. Its value decreases because its performance degrades and because its remaining useful life gets shorter. Economic depreciation also occurs with other assets that have finite useful lives or whose usefulness decreases over time. Economic depletion is the decrease in the value of an asset such as a mineral deposit as it is used up and sold off.

Capital gains are income according to the Haig-Simons definition[3], which measures a person's income as the sum of their consumption and the change in the real value of their net asset holdings.

Capital gains income is the difference between the realized sales price of an asset and its basis, or book value. Basis usually equals the purchase price or other original cost of the asset less accumulated depreciation or depletion. Basis could be adjusted for inflation, but in the U.S. it is not. Depreciation and depletion are calculated according to accounting rules. Depreciation schedules are often claimed to be an approximation to economic depreciation, but their primary function is to divide payments an asset owner receives over the life of an asset into a return on the owner's asset, which is income, and the return of the owner's initial investment, which is not. In addition, the depreciation schedules in tax codes often intentionally depart from economic depreciation by allowing accelerated depreciation or allowing an asset to be depreciated more than once.

The accounting concept of capital gains income differs from the economic concept of capital gains in at least three important ways. First, capital gains income is a measure of the gain realized when an asset is sold, while a capital gain or loss occurs when the asset's value changes whether it is sold or held. Second, capital gains should be measured in terms of purchasing power, i.e. with the effects of inflation removed from an asset's price, while capital gains income generally is measured in nominal terms, with no adjustment for inflation. Third, accounting depreciation generally does not equal economic depreciation.

2. Neutral Taxation of Capital Gains

The basic rule for an income tax to be neutral between assets that provide part or all of their return as capital gains and assets that provide a stream of ordinary income is straightforward to state but difficult, if not impossible, to implement.

Capital gains should be taxed (and capital losses deducted) as they accrue, with basis adjusted for inflation and economic depreciation. Alternatively, gains could be taxed (and losses deducted) when they are realized, with basis adjusted for inflation and economic depreciation and with interest charged (or paid in the case of losses) from the time the gain accrued to the time it was realized.

This rule has been known for a long time. It is at least implicit in Vickrey[4]. Samuelson[5] derives it explicitly, with a special emphasis on the role of economic depreciation.

[3] On the Haig-Simons concept of income, see, for example, Bernard Salanie, The Economics of Taxation, The MIT Press,2003, 188-190. For whether capital gains are income, see for example, Richard Musgrave and Peggy Musgrave, Public Finance in Theory and Practice, 2nd ed., McGraw-Hill, 1973, 245-6.

[4] Vickrey, William, Averaging of Income for Income-Tax Purposes, Journal of Political Economy 47, 1939, 379-397

If returns are the result of a stochastic process occurring over time, additional conditions must be met, and a neutral tax system can be viewed as a combination of taxation of ex-ante expected gains (i.e. of appreciation at the risk-free rate of return) and insurance against variability of ex-post realized gains.[6]

There are a number of difficulties in implementing this rule. One is that, in either form, it requires gains and losses to be calculated and recorded as they accrue, while many gains and losses can only be known when they are realized by selling an asset. Some types of financial assets have active secondary markets where price discovery occurs continuously. For these assets, gains could be taxed in the year they accrue. In a few cases they are, using mark-to-market rules. Alternatively, past market quotes could be used to assign a realized gain to one or more previous years. However, many types of financial assets and most non-financial assets do not have continuous, or even frequent, price discovery. For these assets, calculating gains and losses as they accrue or on an annual basis would require appraisals or other non-market estimates of market prices. Appraisals can be costly and may be unreliable. Even when expertly done, an appraisal represents the opinion of one party rather than the kind of balancing of potential buyers' and sellers' opinions that occurs in a market. Thus, there are practical limits on the ability to tax capital gains as they accrue. Essentially the same practical limits apply to the ability to tax gains on realization but with interest from the time of accrual. The size of the gain or loss may be known, but it may be impossible to determine when it accrued.

There is also a fairness issue with taxing gains as they accrue. Someone who is holding an asset in expectation that its price will rise over a period of several years may not have cash-flow to pay taxes in any year before the asset is sold.

Another difficulty with implementing neutral taxation of capital gains is that accounting rules generally do not take inflation into account. This affects taxation of other types of income besides capital gains, but is more serious for long-term capital gains than for wages and salaries, for example. Accounting rules could be changed, either in general or for capital gains only. Adjusting purchase prices and depreciation for inflation would require tax agencies to publish additional tables and instructions, tax software developers to build additional calculations into their programs, and taxpayers to make the additional calculations correctly.

A final difficulty is the fact that accounting depreciation generally is not equal to economic depreciation. This means that gains and losses calculated from financial statements may be different from economic gains and losses.

---

[5] Samuelson, Paul, Tax Deductibility of Economic Depreciation to Insure Invariant Valuations, The Journal of Political Economy 72, 1964, 604-606

[6] Francesco Menoncin and Paolo Panteghini, Ex-Post Equivalence under Capital Gains Taxation, Economics Bulletin 32, 1671-79, 2012.

3. Processes that Produce Capital Gains and Capital Gains Income

There are three types of economic processes that can produce capital gains or losses. These processes will also generally produce capital gains income. There are also a number of processes where divergences between accounting rules and economic reality produce capital gains income, with or without economic capital gains. This paper examines four, but there may be others.[7]

Economic Capital Gains

The three processes that can produce capital gains or losses are a) new information or resolution of uncertainty, b) correctly anticipated changes over time in the supply or demand for an asset, and c) natural growth.

These processes do not operate in isolation, and any particular instance of capital gains income may result from two or more processes.

New Information or Resolution of Uncertainty

When the future revenue stream from an asset is uncertain, the price of the asset will reflect possible future revenue streams, potential investors' judgments of the likelihood of various revenue streams occurring, and a risk premium. When new information affecting any of these becomes available, the price of the asset generally will change. Favorable news will cause the price to increase, and owners of the asset will have a capital gain. Unfavorable news will produce a capital loss.

For example, the share price for a business startup will reflect the fact that, over time, a few startups are very successful, more are modestly successful, and many fail. If a startup succeeds, the value of the business will be based on the stream of profits it can be expected to generate in the future. If it fails, its value will be zero. Before it is clear how successful a particular startup will be, potential investors will value it based on potential profits if it succeeds and their judgment of the likelihood that it will succeed. As it becomes clear whether the business will succeed or fail, its value will rise or fall, and the owners will have a capital gain or loss.

If market prices reflected all current information, the expectation of future gains and losses on any one asset would be approximately zero. If, in addition, there were many new pieces of information in a period, and the reactions of individual asset prices to each piece of news were sufficiently diverse, the expectation of the sum of gains and losses from new information would be approximately zero. If asset price reactions to business cycle-related

[7] For a very general treatment of the tax consequences of accounting depreciation that differs from economic depreciation see Erik Biorn, Capital Decay and Tax Distortions: How to Abandon Exponential Decay and Benefit from It, Memorandum 27/2009, Department of Economics, University of Oslo, 2009.

information are correlated, the expectation of the sum of gains and losses from new information might be non-zero at any time but be approximately zero over a business cycle.

Anticipated Changes over Time in Supply or Demand

An asset can increase in value over time because demand for that type of asset is increasing. For example, in an area with a growing population, the demand for land for housing will grow over time. If the supply is limited, the price of land that can be used for housing is likely to increase over time. Investors are likely to buy and hold land in anticipation of being able to sell it for development in the future. The price of land in other uses, such as agriculture, will be higher than it would be without expected appreciation and will be increasing over time.

An asset also can increase in value over time because the supply of that type of asset is decreasing. For example the value of a high-quality ore body will increase over time as other deposits of similar quality are mined and exhausted.

On the other hand, an asset's price can decrease over time if the supply of similar assets grows faster than the demand. This could be due to technical change that increases the productivity of existing assets. It could be due to technical change that introduces new production processes making old assets obsolete. It also could be due to changes in taste or a falling population.

In this process, the asset's current price depends partly or entirely on the belief that the price will be different in the future. For assets that provide no current revenue or services, the return from holding the asset must come entirely from appreciation. For assets that do provide current revenue or services, the current price will reflect the present value of the stream of revenue or services and the expected future sales price.

This process differs from the first in that it does not depend on new information or resolution of uncertainty. An increase in the price of housing because of a correctly anticipated increase in population would be an example of the second process. An increase in the price of housing because of an unexpected oil boom would be an example of the first.

Natural Growth

Trees, young livestock, and some other naturally growing assets provide income only when they are eventually sold. For most of these assets, the owner faces a tradeoff between harvesting and selling the asset now and harvesting and selling more of the asset in the future. Since there are no payments for holding the asset, the only return the owner receives is from appreciation.[8]

[8] It is possible to argue that apparent gains due to natural growth actually are the result of unpriced inputs, usually sunlight and other environmental factors. On this view, the gains would result from a divergence between accounting rules and economic reality, as in the following processes.

Capital Gains Income without Capital Gains

Processes where divergences between accounting rules and economic reality can create capital gains income include a) investment of retained corporate earnings, b) excess depreciation, c) sweat equity or other off-the books capital contributions, and d) inflation.

Investment of Retained Corporate Earnings

A corporation can finance new investment by retaining part or all of its earnings rather than distributing them to shareholders. If the investment is successful, this will increase future earnings per share. This should increase the share price, and shareholders who sell their shares will realize capital gains income from the price increase. Shareholders do not have an economic capital gain, because their gain results entirely from accounting rules that defer their recognition of income.

Under U.S. accounting rules, income of most pass-through entities and sole proprietor businesses is attributed to the owners each year. If income attributed to an owner is greater than income distributed to that owner, the difference is treated as a contribution to capital. If distributions to an owner are greater than income attributed to that owner, the excess is considered a distribution of capital. If the business retains some of its income, the owners are treated as if they had received the income and then reinvested it in the business. This increases their basis in the company in exactly the same way as if they had contributed the same amount of capital from an unrelated source. This accounting treatment matches the economic reality. The business produced income. The owners have the choice of what to do with that income. They could have withdrawn it from the business and spent it on consumption or invested it elsewhere. The fact that they chose to reinvest it in the business that produced it does not change the fact that it is their income.

U.S. accounting rules treat a corporation's income as the owners' income only to the extent that the corporation distributes that income to them as dividends. Income that the corporation retains for reinvestment is not counted as income for the shareholders. This does not match the economic reality. The business has produced income. The management and board of directors, acting as agents for the shareholders, could have distributed the income for the shareholders to spend or invest elsewhere. The fact that they chose to reinvest it in the business should not change the fact that it is the shareholders' income, but does.

This process defers recognition of shareholders' income, and it mischaracterizes ordinary income as capital gains income.

Excess Depreciation

The owner of a depreciable asset realizes a gain when he or she sells the asset for more than its purchase price less accumulated depreciation. One reason this may happen is that accounting depreciation often exceeds actual economic depreciation. Under U.S. law, part or all of this gain may be treated as ordinary income, and the remainder is treated as capital gains income.[9] U.S. law also allows the buyer of a used asset to restart depreciation based on the purchase price. This can allow an asset to be depreciated multiple times over its life.

Economic depreciation is the decrease in an asset's value due to wear and tear from use and the passage of time or due to obsolescence. Accounting depreciation at its best is an approximation to economic depreciation. In practice, it is a formula used to recover the cost of an asset over a fixed life. Depreciation schedules in tax codes often are deliberately designed to overstate depreciation in the early years of an asset's life and understate it later, either as a temporary measure intended to spur investment in a recession or as an incentive for certain types of investment.

In addition, while accounting depreciation is a value produced by a formula, economic depreciation is a choice variable. Most production processes provide ways to trade more maintenance for less economic depreciation. As an extreme example, it may be possible to maintain an asset, such as an apartment building, so that its value remains unchanged while several successive owners fully depreciate it.

This process creates or enhances capital gains income by mis-measuring costs and income and therefore understating the basis of an asset. This can result in deferral of the recognition of income and the mis-characterization of ordinary income as capital gains income.

Sweat Equity

While U.S. law does not allow pass-through entities or sole-proprietor businesses to retain earnings without recognizing them as the owners' income, it does allow another common means for understating basis. This is sweat equity: off-the books contributions of capital to a business through un- or under-compensated labor by the owners. [10]

U.S. law[11] requires that a business pay "reasonable" compensation for compensation to be deductible as a business expense, but this generally is interpreted as "not excessive" rather than as "not unreasonably lower than market."

When an owner pays him-or-herself below market (or no) wages for time worked in the business, the tax consequences depend on what the labor is used for. If it is used in the business' ongoing production process, the firm's current business expenses will be

[9] For personal property used in manufacturing, resource extraction, transportation, communications, or public utilities and for real property consisting of single-purpose agricultural and horticultural structures and petroleum storage facilities, gains up to the amount of accumulated depreciation are taxed as ordinary income and gains over that amount are taxed as capital gains income (26USC1245). For real property, gains up to a percentage of any excess of actual depreciation over straight-line depreciation are taxed as ordinary income and any gains over that amount are taxed as capital gains income (26USC1250).

[10] When an employee is granted part-ownership in exchange for un- or under-compensated work or one partner contributes labor while others contribute money, the value of the resulting ownership shares may be counted as taxable compensation.

[11] 26USC162

understated and its profits will be overstated by the same amount. The owner's income from the business will be overstated, but the owner's wage and salary income will be understated by the same amount, and there generally will be no tax consequences.

If the owner's uncompensated labor is used to increase the firm's capital stock, the situation is different. This may take the form of the owner's time being used to construct physical plant and equipment. It may take the form of the owner's time being used to create intellectual property, such as computer code or patentable ideas. Or, the owner's uncompensated time may indirectly fund capital accumulation by substituting for purchased inputs, freeing up funds to purchase capital goods.

In all of these cases, the cost of the firm's assets is understated, and the owner's current income and basis in the business are understated. If the owner later sells his or her stake in the company or liquidates the company, this understated basis can create capital gains income whether or not there are economic capital gains.

In a world with ideal accounting, business owners would pay themselves a market wage for all work they do for the business, and the value of owners' labor would be included in the basis of any assets produced, either directly or indirectly, by that labor. Business owners would pay income tax on the full value of their labor (possibly offset by losses from the business.) In a world where business owners can make off-the-books capital contributions through un- or under-compensated labor, they are able to defer taxes on the income from that labor until they sell the assets it produced, and mis-characterize that income as capital gains income.

Inflation

Under U.S. law, basis in an asset is not adjusted for inflation in calculating capital gains income. When there has been inflation between the purchase and sale of an asset, the sales price will reflect general inflation as well as any changes in the relative price of the asset. If the purchase price has not been adjusted for inflation, part of any difference between the sales price and the purchase price less accumulated depreciation will be purely inflationary. This will cause capital gains income to exceed real capital gains and may even result in positive capital gains income when there is a real capital loss.

Most Gains Involve Multiple Processes

The processes that produce capital gains income are not mutually exclusive, and more than one may be involved in any instance of capital gains income. For example, the gain or loss from selling corporate stock is likely to include components from retained earnings, from multiple instances of new information, and from inflation. Whatever other processes may have been at work, all capital gains income will include an inflationary component.

Some feel for the relative importance of the different processes can be gained from studies done by the Internal Revenue Service and two states, Wisconsin and Montana, which estimated the proportion of gains on sales of different types of assets[12]. All categories of assets can produce capital gains income or losses from more than one of the seven processes, but some processes are impossible or unlikely for some types of assets. Table 1 gives a seven-way classification of assets whose sale may result in capital gains income or loss and shows which processes may produce gains and losses for each.

Table 1. Types of Assets and Associated Capital Gains Processes

Asset Category	Resoulution of Uncertainty	Anticipated Changes in Supply or Demand	Natural Growth	Retained Earnings	Excess Depreciation	Sweat Equity	Inflation
Securities	✓			✓		✓	✓
Sale of Principal Residence	✓	✓				✓	✓
Sale of Land	✓	✓					✓
Sale or Trade of Business Property	✓	✓			✓		✓
Livestock and Timber	✓	✓	✓				✓
Commodity and Other Futures Contracts	✓						✓

All asset categories may have gains or losses from resolution of uncertainty or inflation. Gains from anticipated changes in supply or demand are generally limited to primary productive assets rather than to secondary financial assets. Gains from natural growth are limited to livestock and timber, gains from retained earnings are limited to corporate stock, which is the largest part of the securities category, and gains from excess depreciation are limited to sales of depreciable business property. Gains from understated basis due to sweat equity generally are limited to sales of ownership interests in pass-through entities, which are part of the securities category, and sales of principal residences.

Capital gains income or losses from accounting that does not reflect economic reality generally are limited to securities (retained corporate earnings and sweat equity in pass-through entities), sales of principal residences (sweat equity), and sale or trade of business property (excess depreciation).

Table 2 shows how identifiable capital gains realizations were distributed between these five categories in the IRS, Wisconsin, and Montana studies. Not all gains could be put in one

[12] Janette Wilson and Pearson Liddell, Sales of Capital Assets Reported on Individual Tax Returns, 2008-2009, IRS Statistics of Income Bulletin, Spring 2013, 59 – 111; Janette Wilson and Pearson Liddell, Sales of Capital Assets Reported on Individual Tax Returns, 2007, IRS Statistics of Income Bulletin, Winter 2010, 75 – 104; Janette Wilson and Pearson Liddell, Sales of Capital Assets Panel Data, Tax Years 1999-2003, IRS Statistics of Income Bulletin, Summer 2009, 197 – 228; Janette Wilson, Sales of Capital Assets Reported on Individual Income Tax Returns, 1999, IRS Statistics of Income Bulletin, Summer 2003, 132 – 154; Janette Wilson, Sales of Capital Assets Reported on Individual Income Tax Returns, 1998 and 1997, IRS Statistics of Income Bulletin, Summer 2002, 149 – 190; Janette Wilson, Sales of Capital Assets Reported on Individual Income Tax Returns, 1997, IRS Statistics of Income Bulletin, Summer 2001, 152- 174;Yeang-Eng Braun, The Tax Benefit, Distribution and Asset Composition of Capital Gains in Wisconsin, Wisconsin Department of Revenue, 2002; Dan Dodds and Larry Finch, Study of Schedule D (Capital Gains) and Schedule E (Rents, Royalties, Partnership) Income Reported on Individual Income Tax Returns Tax Years 2002-2006, Montana Department of Revenue 2010.

of these categories. Some could not be identified from the information on the return. Others were reported in secondary categories that indicate how the taxpayer received the gain, but not the underlying type of gain. These include gains allocated from a pass-through entity and gains on an installment sale.

Table 2. Capital Gains Realizations by Category

	IRS 1997 - 2003, 2007-2009		Wisconsin 1989 & 1999		Montana 2002 - 2006	
Asset Category	$ million	%	$ million	%	$ million	%
Securities	$1,159,954.3	60.8%	$3,029.2	53.5%	-$11.2	-0.3%
Sale of Principal Residence	$68,110.5	3.6%	$40.2	0.7%	$298.6	7.7%
Sale of Land	$187,790.3	9.8%	$685.5	12.1%	$939.1	24.2%
Sale or Trade of Business Property	$408,210.5	21.4%	$1,415.4	25.0%	$2,260.0	58.2%
Livestock and Timber	$51,370.1	2.7%	$485.6	8.6%	$460.1	11.8%
Commodity and Other Futures Contracts	$33,017.7	1.7%	$3.6	0.1%	-$62.8	-1.6%
Total Classified Gains	$1,908,453.4		$5,659.4		$3,883.7	
Unclassified or Unidentified	$1,745,769.0		$3,891.0		$2,604.8	

The distribution of net gains between categories is fairly similar for the IRS and Wisconsin studies, with a majority of classified gains coming from securities and with business property and land in second and third places. In the Montana study, gains and losses on securities were essentially a wash, with net gains in three years being cancelled by net losses in two years. This left business property and land as the two largest categories. The difference in results is partly due to the fact that gains and losses on securities are very volatile over the business cycle and the studies cover different years. It is also partly due to local circumstances in Montana, where the state's largest energy utility, whose stock had been a popular retirement investment in the state, sold its energy business, used the proceeds to become a long distance telephone company, and then failed to survive the shakeout in that industry that occurred in the early 2000s.

In any case capital gains income appears to come largely from transactions where gains are likely to be at least partly due to accounting that does not match economic reality. For corporate stock, gains from retained earnings should be significant if not dominant: In US national accounts from 1984 through 2012, an average of 37% of after-tax corporate profits were undistributed.

4. Do Tax Laws and Accounting Rules Advantage or Disadvantage Capital Gains Income?

This section begins by demonstrating the neutrality of capital gains taxation on accrual, with economic depreciation and basis adjusted for inflation. It does this first for the case of a one-time gain or loss due to new information and then for the case of appreciation over time due to either anticipated changes in market conditions or natural growth. This is followed by an examination of the consequences of departures from neutral taxation. It examines the effects of taxing on realization and not adjusting for inflation. It also examines cases where capital gains income for tax purposes is different from economic capital gains. For each case, conclusions are stated and explained first and then are demonstrated mathematically. This allows readers who are just interested in the conclusions to skip the math.[13]

For each mathematical demonstration, the present value of after-tax net income from an investment is calculated with neutral taxation and with one of the departures from neutrality. If the present value is higher with the departure from neutrality, this indicates that this aspect of U.S. tax law gives an incentive for taxpayers to invest in assets that pay part or all of their return as capital gains income rather than other assets. If the present value is lower with the departure from neutrality, this indicates that this aspect of U.S. tax law gives in incentive for taxpayers to avoid assets that promise capital gains.

When taxation is not neutral between types of investments, there generally will be over-investment in the favored assets and under-investment in the dis-favored assets. This will cause asset prices to adjust to equalize after-tax returns.

In most of the scenarios considered, assets will be assumed to produce a stream of returns, denoted R. When a scenario involves more than one revenue stream, they are differentiated by subscripts. The market price of an asset is designated by P, with different assets and different times indicated by subscripts. The present value of the income stream from an asset is denoted PV, with subscripts used to differentiate assets and scenarios. Income from non-capital-gains assets is assumed to be taxed at a single rate, τ, and capital gains are assumed to be taxed at a single, possible different, rate, τ_c. When it is relevant, corporate income is assumed to be taxed at a single rate τ_K. Inflation is assumed to be constant at the rate $c = \dot{CPI}/CPI$. The nominal interest rate is denoted by r, and ρ is used to indicate the real interest rate, i.e. $\rho = r - c$.

Taxing Gains and Deducting Losses on Accrual, with Economic Depreciation and Basis Adjusted for Inflation is Economically Neutral

One-Time Gains and Losses from New Information

Conclusions

1. If investors care only about the average expected return from an investment and are indifferent to either the variability of possible returns or the size of possible losses, then

[13] The results presented here are tied to specific features of U.W. tax law, and there is no attempt to present general theorems. For some extremely general results with limited specific policy relevance, see Biorn, 2009.

taxing one-time gains from new information and fully deducting losses as they accrue, with basis adjusted for inflation and economic depreciation, does not affect investors' incentives to choose between assets, regardless of the tax rate on capital gains income. This is because the expected tax on possible gains equals the expected tax benefit of deducting possible losses.

On average, taxing and deducting one-time gains in this way would produce no tax revenue as long as investors care only about average expected returns.

2. If investors require a higher average expected return to accept more variability in returns or the possibility of losses, taxing gains and deducting losses on accrual, with basis adjusted for inflation and economic depreciation gives investors an incentive to accept more variability of returns or a greater possibility of losses. This is because taxing one-time gains and deducting one-time losses symmetrically reduces the variability of after-tax returns and reduces the size of potential after-tax losses.

If investors require a higher average expected return to accept more variability or the possibility of losses, taxing and deducting one-time gains and losses in this way will produce some revenue. Essentially, the tax system provides some degree of insurance for investors, and the net tax they pay on one-time gains is equivalent to an insurance premium.

Demonstration

Suppose there is an asset that will yield one of two income streams, R_1e^{ct} or R_2e^{ct}, which are fixed in real terms (i.e. growing at the rate of inflation) and which are expected to continue indefinitely. Which it will yield becomes known at time 0. This may be the result of a random event or of a non-random fact that is publicly known after time 0 but not before. Before time 0, the probability of income stream 1 occurring is π, and the probability of income stream 2 occurring is $1-\pi$. These probabilities may represent the probability of a random event occurring or beliefs about the likelihood of unknown facts.

Assume that potential asset owners are risk neutral and therefore compare investments solely on their present values. Thus, the asset's price immediately before uncertainty is resolved at time 0, P_{0A}, will be the expectation of the present values of the two income streams, PV_1 and PV_2.

With no capital gains taxation, the value of the asset immediately before uncertainty is resolved is

$$(1)\quad PV_0 = \pi \int_0^{\infty} (1-\tau) R_1 e^{ct} e^{-rt} dt + (1-\pi) \int_0^{\infty} (1-\tau) R_2 e^{ct} e^{-rt} dt$$

$$= \pi \int_0^{\infty} (1-\tau) R_1 e^{-\rho t} dt + (1-\pi) \int_0^{\infty} (1-\tau) R_2 e^{-\rho t} dt$$

$$= (1-\tau) \frac{(\pi R_1 + (1-\pi) R_2)}{\rho}$$

With accrual-based capital gains taxation and full deductibility of losses, the after-tax values of the two possible revenue streams immediately after uncertainty is resolved are

$$(2a)\quad PV1_A = \int_0^{\infty} (1-\tau) R_1 e^{-\rho t} dt - \tau_C \left(\int_0^{\infty} (1-\tau) R_1 e^{-\rho t} dt - P_{0A} \right)$$

$$= \frac{(1-\tau) R_1}{\rho} + \tau_C \left[\frac{(1-\tau) R_1}{\rho} - P_{0A} \right], \qquad \text{and}$$

$$(2b)\quad PV2_A = \int_0^{\infty} (1-\tau) R_2 e^{-\rho t} dt - \tau_C \left(\int_0^{\infty} (1-\tau) R_2 e^{-\rho t} dt - P_{0A} \right)$$

$$= \frac{(1-\tau) R_2}{\rho} + \tau_C \left[\frac{(1-\tau) R_2}{\rho} - P_{0A} \right]$$

where P_{0A} is the pre-uncertainty-resolution price. In both (2a) and (2b), the first term is the present value of after tax income from the realized income stream, and the second term is the capital gains tax rate times the gain or loss from the new information that reveals whether revenue will be R_1 or R_2.

P_{0A} must be the expectation of $PV1_A$ and $PV2_A$:

$$(3)\quad P_{0A} = \pi \left(\frac{(1-\tau_C)(1-\tau) R_1}{\rho} + \tau_c P_{0A} \right) + (1-\pi) \left(\frac{(1-\tau_C)(1-\tau) R_2}{\rho} + \tau_c P_{0A} \right)$$

Rearranging and solving for P_{0A} gives

$$(4) \quad (1-\tau_c)\big(\pi+(1-\pi)\big)P_{0A} = \frac{(1-\tau_c)(1-\tau)(\ \pi R_1+(1-\pi)R_2)}{\rho}, \qquad \text{or}$$

$$P_{0A} = (1-\tau)\frac{(\pi R_1+(1-\pi)R_2)}{\rho},$$

which is the same as equation (1). Accrual-based taxation is neutral in this case. It also should produce no revenue in the aggregate if investor's expectations are unbiased. The tax revenue from capital gains would be exactly offset by the tax effect of deducting losses.

If investors maximize expected utility and are risk averse, the initial price of the asset will satisfy

$$(5) \quad U(P_0) = \pi U\left(\frac{(1-\tau_c)(1-\tau)R_1}{\rho} + \tau_C P_{0A}\right) + (1-\pi)U\left(\frac{(1-\tau_c)(1-\tau)R_2}{\rho} + \tau_C P_{0A}\right),$$

where U is the investor's utility function for known, riskless income.

If investors' choices involving risk are better described by prospect theory with loss aversion, the initial price will satisfy

$$(6) \quad V(P_0) = \pi V\left(\frac{(1-\tau_C)(1-\tau)R_1}{\rho} + \tau_C P_{0A} - P_0\right) + (1-\pi)V\left(P_0 - \frac{(1-\tau_C)(1-\tau)R_2}{\rho} + \tau_C P_{0A}\right),$$

where V is the investor's value function for known gains and losses.

If investors are risk averse or loss averse, the price of the asset will be less than the expectation of the two present values. This is because risk averse or loss averse investors require compensation, in the form of a higher expected return, for bearing the risk.

If investors are either risk averse or loss averse, having τ_C>0 unambiguously reduces risk because it reduces the difference in after-tax income between the two outcomes without changing the expected value. This reduces the risk premium investors will require for taking the gamble, which increases the initial price of the asset. If capital gains are taxed and losses are deductible, risk averse or loss averse investors will be willing to make slightly riskier investments than they would with no tax on capital gains.

Ongoing Appreciation

Conclusions

For gains and losses due to expected changes in market conditions or natural growth, an income tax does not distort investors' choice between assets that promise capital gains income and other assets if gains are taxed and losses are deducted as they accrue, with basis adjusted for inflation and economic depreciation, and capital gains income is taxed at the same rate as income from non-capital gains assets.

Demonstration

For an asset where all of the return is from appreciation, the pre-tax real rate of return is the rate of appreciation minus the rate of inflation, $\dot{P}/P - c$. Capital market equilibrium requires that the after-tax return of a capital gains asset with price P be the same as the after-tax return on an asset with the same price but paying its return as interest:

$$(7) \quad (1-\tau_C)\left(\dot{P} - cP\right) = \rho(1-\tau)P.$$

Neutrality between the two assets requires that the pre-tax rates of return also be equal:

$$(8) \quad \dot{P}/P - c = \rho.$$

Equations (7) and (8) can both be satisfied only if $\tau_C = \tau$, i.e. if capital gains are taxed at the same rate as income from non-capital-gains assets.

For one-time gains, taxing at any rate is neutral as long as gains are fully deductible and the same rate is applied to the income and the deduction. If losses can be used to offset ordinary income on a one-for-one basis, this requires capital gains income to be taxed at the same rate as ordinary income. If capital gains are to be taxed at a different rate than ordinary income, this would require losses to be used to create a credit against tax liability at the same rate as gains are taxed. For ongoing gains, neutrality requires that capital gains and income from non-capital-gains assets be taxed at the same rate. Continuing to satisfy equations (7) and (8) over time requires that gains be calculated in real terms, i.e. adjusted for inflation.

Taxing on Realization Distorts Investment Choices Towards Capital Gains Assets

Conclusions

1. Taxing capital gains income on realization distorts the choice between assets unless taxpayers are charged interest from the time a gain accrued to the time it was realized and are paid interest from the time a loss accrued to the time it was realized.

2. If gains are taxed and losses are deducted on realization without interest since accrual, an income tax provides an incentive for taxpayers to invest in assets that promise part or all of their return as capital gains income. This is because investing in a capital gains asset allows the taxpayer to defer taxes from the time income accrues to the time it is realized. The incentive to choose capital gains assets instead of other assets is stronger if capital gains income is taxed at a lower rate than income from non-capital-gains assets or if basis is adjusted for inflation.

3. Taxing gains and deducting losses on realization gives taxpayers an incentive to realize losses immediately and to hold assets with unrealized gains indefinitely.[14]

Demonstration

One-Time Gains and Losses from New Information

For realization-based taxation, the time of sale must be made explicit. Denote the time when the owner sells the asset as T_1 if the income stream is R_1e^{ct} and as T_2 if the income stream is R_2e^{ct}. The present value of after-tax income in each case has three components: a) the present value of after-tax revenue up to the time of sale, b) the present value of the sales price, which will equal the present value at that time of the buyer's after-tax revenue after the sale, and c) the present value of tax on the capital gain (or tax deduction from the capital loss). The gain or loss is the difference between the sales price and the initial value, P_{0R}. The first term in each of equations (9a) and (9b) is the present value of after tax revenue before the sale. The second term is the present value of the sales price, and the third term is the present value of the tax on the gain.

$$(9a)\quad PV_{1R} = \int_0^{T_1}(1-\tau)R_1e^{ct}e^{-rt}dt + e^{-rT_1}\int_{T_1}^{\infty}(1-\tau)R_1e^{ct}e^{-r(t-T_1)}dt$$
$$- e^{-rT_1}\tau_C\left(\int_{T_1}^{\infty}(1-\tau)R_1e^{ct}e^{-r(t-T_1)}dt - P_{0R}\right)$$
$$= \frac{(1-\tau)(1-\tau_C e^{-\rho T_1})R_1}{\rho} + e^{-rT_1}\tau_C P_{0R}, \qquad \text{and}$$

[14] One of the findings of the field of behavioral finance is that most investors hold on to losses and realize gains (See, for example Terrance Odean, Do Investors Trade Too Much?, in Colin Camerer, George Loewenstein and Matthew Rabin ed. Advances in Behavioral Economics, Princeton, Princeton University Press, 2004, 606-632). This is a case where a distortion in the tax code *may* work to offset a distortion in normal choices.

$$(9b) \quad PV_{2R} = \int_0^{T_2} (1-\tau)R_2 e^{ct} e^{-rt} dt + e^{-rT_2} \int_{T_2}^{\infty} (1-\tau)R_2 e^{ct} e^{-r(t-T_2)} dt$$

$$+ e^{-rT_2} \tau_C \left(P_{0R} - \int_{T_2}^{\infty} (1-\tau)R_2 e^{ct} e^{-r(t-T_2)} dt \right)$$

$$= \frac{(1-\tau)(1-\tau_C e^{-\rho T_2})R_2}{\rho} + e^{-rT_2} \tau_C P_{0R}.$$

In both cases, the present value depends on the time of sale. The optimal sale time can be found by differentiating either (9a) or (9b) with respect to sales time.

$$(10) \quad \frac{\partial PV_i}{\partial T_i} = \left(\frac{(1-\tau)R_i e^{cT_i}}{r} - P_{0R} \right) r \tau_c e^{-rT_i}.$$

This derivative goes to zero as T_i goes to infinity. However, for T_i between 0 and infinity, $\partial PV_i/\partial T_i$ is positive if the present value of the after-tax revenue stream from the asset, evaluated at sale-date prices, is greater than the initial price, i.e. there is a capital gain when uncertainty is resolved. $\partial PV_i/\partial T_i$ is negative if there is a capital loss. This means that deferring realization indefinitely maximizes present value if there is a capital gain but minimizes present value if there is a capital loss. Thus, under realization-based taxation, the present value maximizing strategy is to realize losses immediately and to defer realization of gains indefinitely.

The initial price must be the expectation of the two present values:

$$(11) \quad P_{0R} = \pi \left(\frac{(1-\tau)(1-\tau_C e^{-\rho T_1})R_1}{\rho} + e^{-rT_1} \tau_C P_{0R} \right)$$

$$+ (1-\pi) \left(\frac{(1-\tau)(1-\tau_C e^{-\rho T_2})R_2}{\rho} + e^{-rT_2} \tau_C P_{0R} \right).$$

Rearranging and solving for P_{0R} gives

$$(12)\quad (1-\pi e^{-rT_2}\tau_C-(1-\pi)e^{-rT_2}\tau_C)P_{0R}$$
$$=\pi\left(\frac{(1-\tau)(1-\tau_C e^{-\rho T_1})R_1}{\rho}\right)+(1-\pi)\left(\frac{(1-\tau)(1-\tau_C e^{-\rho T_2})R_2}{\rho}\right),\qquad \text{or}$$

$$P_{0R}=\frac{(1-\tau)}{\rho}\frac{(\pi(1-\tau_C e^{-\rho T_1})R_1+(1-\pi)(1-\tau_C e^{-\rho T_2})R_2)}{\left(1-\tau_C(\pi e^{-rT_1}+(1-\pi)e^{-rT_2})\right)}$$

This is the same as equations (1) and (4) only if the capital gains tax rate, τ_C, is zero. Thus realization-based taxation of capital gains is not neutral.

In the United States, a taxpayer can indefinitely defer recognition of a capital gain by holding the asset until death. The taxpayer's heirs then inherit the asset with basis equal to its current market value, and the gain is never recognized. If the taxpayer follows the optimal strategy of immediately recognizing losses and indefinitely deferring recognition of gains, $T_1 = \infty$, and $T_2 = 0$. Substituting these into (12) gives

$$(13)\quad P_{0R}=\frac{(1-\tau)}{\rho}\frac{\left(\pi R_1+(1-\pi)R_2(1-\tau_C)\right)}{\left(1-\tau_C(1-\pi)\right)}.$$

The direction of the incentive effect can be seen by subtracting (4) from (13).

$$(14)\quad P_{0R}-P_{0A}=\frac{(1-\tau)}{\rho}\frac{\left(\pi R_1+(1-\pi)R_2(1-\tau_C)\right)}{\left(1-\tau_C(1-\pi)\right)}-\frac{(1-\tau)}{\rho}(\pi R_1+(1-\pi)R_2),$$

which can be reduced to

$$(15)\quad P_{0R}-P_{0A}=\frac{(1-\tau)\alpha(1-\pi)\tau_C(R_1-R_2)}{\rho\left(1-\tau_C(1-\pi)\right)},$$

which is positive as long as $R_1 > R_2$. But this was the initial assumption – the revenue stream represented by R_1 is higher than the revenue stream represented by R_2.

The initial asset price is higher with realization-based capital gains taxation. The immediate tax savings from a possible loss is greater than the present value of the indefinitely deferred tax from a possible gain. Not all taxpayers will be able to defer recognizing gains forever. Some will want to rebalance their portfolios, and others will need to finance consumption. Taxpayers with the ability to use their assets as collateral can borrow to finance consumption or purchase other assets and can defer taxes forever.[15] Taxpayers who have limited ability to borrow can defer taxation on gains, but not forever.[16] With limited ability to borrow, the advantage of capital gains assets is smaller, but still positive.

Ongoing Appreciation
Assume that the asset will be sold at time T, with the price P_T determined by conditions at time T. The price at time 0 is the price P_0 that, with appreciation at a rate that gives the same after-tax real rate of return as alternative assets, will grow to equal P_T at time T. With neutral, accrual-based taxation, this is

$$(16) \quad P_0 = P_T e^{-\rho T} = P_T e^{-(r-c)T}.$$

With realization-based taxation, the price at time 0 is the present value of the price at T less the present value of the tax on the capital gain realized at T:

$$(17) \quad P_{0R} = P_T e^{-\rho T} - \tau_C (P_T - P_{0R}) e^{-\rho T}.$$

Solving for P_{0R} gives

$$(18) \quad P_{0R} = \frac{(1-\tau_C)}{(1-\tau_C e^{-\rho T})} P_T e^{-\rho T}.$$

[15]See George Constantinides, Capital Market Equilibrium with Personal Tax, Econometrica 51, 611-36, 1983.
[16]See Robert Dammon, Chester Spatt, and Harold Zhang, Optimal Consumptin and Investment with Capital Gains Taxes, The Review of Financial Studies 14, 583-616, 2001.

With realization-based taxation and inflation adjustment for the basis, the present value of the price at T less the present value of tax on the capital gain is

$$(19)\quad P_{0I} = P_T e^{-\rho T} - \tau_C (P_T - P_{0I} e^{cT}) e^{-\rho T}.$$

Solving for P_{0I} gives

$$(20)\quad P_{0I} = \frac{(1-\tau_C)}{(1-\tau_C e^{-rT})} P_T e^{-\rho T}.$$

Since $(1-\tau_C e^{-rT}) < (1-\tau_C e^{-\rho T}) < (1-\tau_C)$, it follows that $P_{0I} > P_{0R} > P_0$.

Realization based taxation provides a subsidy relative to neutral accrual-based taxation, and the subsidy is larger if basis is adjusted for inflation. Again, there are two components to the subsidy: the interest-free deferral of taxes and the lower capital gains tax rate.

Not Adjusting Basis for Inflation Distorts Investment Choices Away from Capital Gains Assets

Conclusions

Capital gains income generally will include a component due to inflation. When gains are entirely due to inflation, taxing capital gains income on realization without adjusting basis for inflation makes assets that will be resold at some time in the future, such as corporate stock, less attractive relative to assets that do not need to be resold, such as corporate bonds. Neutral taxation in this case requires that income from the asset be taxed as regular income and that nominal capital gains that are entirely the result of inflation not be taxed.

When gains are only partly inflationary, not adjusting basis for inflation can offset or exacerbate other distortions, depending on the circumstances.

Demonstration

When basis is not adjusted for inflation, part of any capital gain will be due to inflation. In the previous cases, a real capital gain may have been augmented by inflation, and in most cases, inflation adjustment exacerbates, rather than corrects, the preferential treatment that capital gains receive from realization-based taxation. This section looks at the case where a taxpayer has a gain in nominal terms but not in real terms. This case could arise with non-depreciable assets, such as real estate or stock in a corporation that distributes all its earnings as dividends, or with depreciable assets where book depreciation equals economic depreciation.

Suppose that the price level is rising at the rate c, and that there is an asset with initial price P_0 that will pay a real return R forever. This asset's price must also be rising at the rate of inflation. With accrual-based capital gains taxation with inflation-adjusted basis, the present value of the revenue stream from holding this asset until time T and then selling it is

$$(21) \quad PV_0 = (1-\tau)\int_0^T Re^{ct}e^{-rt}dt + P_0e^{cT}e^{-rT} - \tau_C\int_0^T \{cP_0e^{ct} - cP_0e^{ct}\}e^{-rt}dt$$

Where cP_0e^{cT} is both the instantaneous increase in the asset's price and the instantaneous inflation adjustment to the owner's basis. Real capital gains are taxed as they accrue, but since the asset's price is only increasing with inflation, there are no real gains to tax. If the asset sells for the present value of its future revenue stream, P_0=PV_0, then equation (21) can be solved for P_0, giving

$$(22) \quad P_0 = \frac{(1-\tau)R}{\rho}.$$

If capital gains are taxed on realization with no inflation adjustment, then the present value of the future revenue stream is

$$(23) \quad PV_1 = (1-\tau)\int_0^T Re^{ct}e^{-rt}dt + P_1e^{cT}e^{-rT} - \tau_C(P_1e^{ct} - P_1)e^{-rT}$$

where P_1 is the initial price. If P_1 = PV_1, equation (23) can be solved for P_1 to give

$$(24) \quad P_1 = \frac{(1-\tau)R(1-e^{-\rho T})}{\rho(1-(1-\tau_C)e^{-\rho T} - \tau_C e^{-rT})}.$$

This is (22) multiplied by the expression $\left(1-\frac{1}{(1-(1-\tau_C)e^{-\rho T}-\tau_C e^{-rT})}\right)$,which is less than 1. Thus, taxing on realization with no inflation adjustment is biased against capital gains assets. If capital gains are taxed on realization and basis is adjusted for inflation, then the present value of the future revenue stream is

$$(25)\quad PV_{1I}=(1-\tau)\int_0^T Re^{ct}e^{-rt}dt+P_{1I}e^{cT}e^{-rT}-\tau_C(P_{1I}e^{ct}-P_{1I}e^{ct})e^{-rT}.$$

Since the inflation adjusted basis equals the sale price, capital gains and the capital gains tax are zero. Substituting P_{1I} for PV_{1I} and solving for P_{1I} gives

$$(26)\quad P_{1I}=\frac{(1-\tau)R}{\rho},$$

which is equal to P_0. Realization-based taxation with inflation-adjusted basis is neutral in this case without charging interest from the date when the gain accrued, but only because there are no gains in real terms.

Retained Corporate Earnings Distorts Investment Choices Towards Capital Gains Assets

Conclusions

1. When a taxpayer has capital gains income because a corporation that he or she owns stock in has successfully invested retained earnings, there is no economic capital gain. There is capital gains income only because U.S. tax law and accounting conventions do not attribute a corporation's income to its owners unless that income is distributed as dividends. Under ideal accounting, retained earnings would be treated as shareholders' income that is reinvested in the company, increasing the shareholders' basis in their stock. Any increase in stock price that results from investment of retained earnings would be attributed to increased basis rather than counted as capital gains income.

2. Whether this arrangement gives taxpayers an incentive to invest in corporations that will retain earnings rather than pay dividends depends on corporate tax rates and individual tax rates on both capital gains income and income from non-capital-gains assets as well as on expected rates of return and the time investors expect to hold shares of stock

before reselling them. In most cases, there is an incentive to invest in corporations that will retain earnings. This is primarily due to the fact that this arrangement allows investors to defer taxes from the time when a corporation earns income on their behalf to the time when they sell its stock.

Demonstration

Suppose that investors are considering creating a corporation with initial assets of K_0. Let k be the pre-tax corporate rate of return, which the corporation is expected to earn indefinitely. If the corporation will pay out all its after-corporate-tax earnings as dividends, the value of the corporation to potential investors is

$$(27) \quad PV_0 = \int_0^\infty (1-\tau)(1-\tau_K)kK_0e^{-rt}dt = \frac{(1-\tau)(1-\tau_K)kK_0}{r},$$

which equals K_0 if the corporate rate of return after both corporate and individual taxes, $(1-\tau)(1-\tau_K)k$, equals the discount rate r.

Suppose instead, that the corporation plans to retain and reinvest all its after-tax earnings through date T and then begin paying all its after-tax earnings as dividends. At time T, the firm's capital stock will have grown to $K_0e^{(1-\tau_K)kT}$, which will also be its market value.

If the initial investors sell out at time T, they will report receiving no taxable income from their ownership of the corporation between 0 and T, and, at T they will have capital gains income per share equal to the increase in the share price.

The value to investors at time 0 is

$$(28) \quad PV_1 = (1-\tau_C)K_0e^{(1-\tau_K)kT}e^{-rT} + \tau_CK_0e^{-rT} = K_0\left((1-\tau_C)e^{((1-\tau_K)k-r)T} + \tau_Ce^{-rT}\right)$$

if basis is not adjusted for inflation. If basis is adjusted for inflation, the value at time 0 is

$$\begin{aligned}(29) \quad PV_{1I} &= (1-\tau_C)K_0e^{(1-\tau_K)kT}e^{-rT} + \tau_CK_{0e^{cT}}e^{-rT} \\ &= K_0\left((1-\tau_C)e^{((1-\tau_K)k-r)T} + \tau_Ce^{-(r-c)T}\right).\end{aligned}$$

In both (28) and (29), the term in brackets is the ratio of the value of the firm if it retains earnings to the value if it does not. This term is not necessarily greater than one, but is for all plausible values of the parameters. It is only less than one if the capital gains tax rate is significantly higher than the tax rate on income from non-capital-gains assets.

In the normal case where $PV_1 > PV_0$, the difference is due to the fact that taxes are deferred interest-free and are paid at the lower capital gains rate. Since 2003, U.S. law has taxed dividends at the capital gains rate. This leaves tax deferral as the only source of gains for the taxpayer. This reduced, but did not eliminate, the incentive for corporations to retain earnings.

Adjusting the basis for inflation increases the subsidy that realization-based taxation gives to retained earnings.

Accelerated or Excess Depreciation Distorts Investment Choices Towards Capital Gains Assets

Conclusions

1. Accelerated depreciation reduces the present value of tax payments on income from an asset. This gives investors an incentive to buy assets where accelerated depreciation is allowed rather than assets where depreciation approximates economic depreciation. This is because accelerated depreciation defers taxes.

2. If an asset with accelerated depreciation is sold before it is fully depreciated, the owner will have capital gains income because the owner's basis in the asset will be less than its market value. This is a case of capital gains income with no economic capital gain.

3. The incentive to invest in assets with accelerated depreciation rather than other assets is smallest if all of the gain from the resale is taxed as ordinary income, larger if part of the gain is taxed as ordinary income and part is taxed at a preferential capital gains rate, and largest if all of the gain is taxed at a preferential capital gains rate.

Demonstration

Tax law and accounting rules often allow depreciation that is faster than economic depreciation, and in some cases they allow an asset to be depreciated more than once. This produces capital gains income when the asset is sold because the owner's basis is less than the market value. This is true even when there is no economic capital gain.

To examine the consequences of this accounting treatment it is necessary to consider four cases. First, the tax impact of accelerated depreciation is considered when the owner keeps the asset until it is taken out of service. There is no capital gains income in this case, but examining it is necessary to isolate the additional tax impacts when an over-depreciated asset is sold. The second case is where all of the gain is considered to be ordinary income. This is the case for most classes of assets in the U.S. when the gain is less than accumulated depreciation. This case is considered for completeness and to help in showing the effect of preferential tax rates for capital gains income. The third case is where gains up to accumulated depreciation are considered ordinary income and gains in excess of accumulated depreciation are considered capital gains income. This is the case for most classes of assets in the U.S. The fourth case is where all the gain is considered to be capital gains income and taxed at the capital gains rate. This is the case in the U.S. with some rental housing.

Baseline: Economic Depreciation

Suppose an asset with initial cost K has an economic life of T years with no scrap value at the end of its life, that straight-line depreciation over the asset's life accurately reflects both the wear and tear from time and use and the corresponding decline in the asset's market value, and that the asset earns a constant annual rental R over its life. The present value of the owner's after-tax income stream is

$$(30)\quad PV_0 = -K + \int_0^T Re^{-rt}dt - \int_0^T \tau\left(R - \frac{K}{T}\right)e^{-rt}dt,$$

where the first integral is the present value of pre-tax income and the second is the present value of taxes on net income after depreciation.

Solving (30) yields

$$(31)\quad PV_0 = (1-\tau)R\frac{(1-e^{-rT})}{r} - K\left(1 - \frac{\tau}{T}\frac{(1-e^{-rT})}{r}\right).$$

The first term is the present value of the stream of after-tax revenue the asset will produce. The second term is the initial cost of the asset less the present value of the tax benefit of depreciation over the asset's life.[17]

Case 1: Accelerated Depreciation with no Resale

In many instances, the IRS code allows accelerated depreciation. All have the same type of effect. They increase depreciation deductions early in the asset's life with offsetting decreases in depreciation deductions later. This defers tax on income earned from the asset but leaves the total amount of taxes paid over the asset's life unchanged.

[17] With an income-based consumption tax with expensing of investment, the second term would be simply K(1-τ), the cost of the asset less the tax deduction for its immediate expensing.

The simplest case to analyze is where an asset's depreciation life that is shorter than the asset's economic life[18]. Let the economic life of the asset be T years and the depreciation life be T_1 years, with $T_1<T$. In this case, the asset's owner gets a depreciation deduction of K/T_1 per year for T_1 years and no deduction for the remaining $T-T_1$ years. Equation (30) becomes

$$(32) \quad PV_{AD1} = -K + \int_0^T Re^{-rt}dt - \int_0^T \tau Re^{-rt}dt + \int_0^{T_1} \tau \frac{K}{T_1} e^{-rt}dt\,,$$

which can be solved to give

$$(33) \quad PV_{AD1} = (1-\tau)R\frac{(1-e^{rT})}{r} - K\left(1 - \frac{\tau}{T_1}\frac{(1-e^{-rT_1})}{r}\right).$$

With accelerated depreciation, a taxpayer facing a single marginal tax rate pays the same total undiscounted taxes over the life of the asset, but accelerated depreciation tilts the stream of tax payments into the future, decreasing the present value of taxes and increasing the present value of the after-tax revenue stream. The gain to the taxpayer from accelerated depreciation is the increase in the present value of the tax benefit of depreciation deductions:

$$(34) \quad PV_{AD1} - PV_0 = \frac{\tau K}{T_1}\frac{(1-e^{-rT_1})}{r} - \frac{\tau K}{T}\frac{(1-e^{-rT})}{r}.$$

Resale Value with Restarted Depreciation

With accelerated depreciation, the book value of the asset will be less than its market value and, if the owner sells the asset, there will be a book gain. In the United States, the gain may be taxed several different ways depending on the type of asset. There are two general types of rules. In one, the whole gain is taxed at the capital gains rate. In the other, part of the gain is treated as recapture of excess depreciation and is taxed as ordinary income, and any gain over that amount is taxed at the capital gains rate.

[18] For a very general discussion of the effects of departing from economic depreciation, see Erik Biørn, Capital Decay and Tax Distortions: How to Abandon Exponential Decay and Benefit from It, Memorandum 27/2009, Department of Economics, University of Oslo.

The price a buyer will pay for a second-hand asset depends on depreciation the buyer is allowed to take. In the U.S., the general rule is that the buyer restarts depreciation with basis equal to the purchase price and the same depreciation life as if the asset were new. For example, the buyer of a second-hand asset with a ten-year depreciation life will restart depreciation over ten years whether the asset is one, eight, or twenty years old. However, the buyer may elect a depreciation method that does not have a fixed life, such as depreciation per unit of production.

Assume that the original owner sells at time $\hat{T} < T$, and that the remaining useful life of the asset is less than the depreciation life, i.e. $T - \hat{T} < T_1$[19]. The buyer will be willing to pay a price $P_{\hat{T}}$ which equals the present value at $\hat{T}$ of the buyer's after-tax revenue stream:

$$(35) \quad P_{\hat{T}} = \int_{\hat{T}}^{T} \left(R - \tau \left(R - \frac{P_{\hat{T}}}{T_1} \right) \right) e^{-r(t-\hat{T})} dt,$$

which can be solved to give

$$(36) \quad P_{\hat{T}} = \frac{(1-\tau)R\left(1 - e^{-r(T-\hat{T})}\right)}{\left(r - \frac{\tau}{T_1}\left(1 - e^{-r(T-\hat{T})}\right) \right)}.$$

This is essentially the same as (31) would be if competition were assumed to equate the asset's initial cost K with its value to investors, PV_0.

If the sale price is more than the original owner's basis, the owner will realize a gain, which may be treated as capital gains income, as ordinary income, or as partly one and partly the other.

Restarting depreciation is not necessarily advantageous to the second owner. The second owner gets to restart depreciation with basis equal to the purchase price, rather than the first owner's remaining basis, but, if the depreciation life is greater than the remaining economic life, the second owner will never be able to fully depreciate the asset. Ideal accounting would have the second owner depreciate the purchase price over the remaining economic life. If the remaining economic life of the asset is less than the depreciation life,

[19] If this is not the case, it will eventually be profitable for the second owner to sell to a third, and so on, because a new owner would be able to take additional depreciation deductions that are not available to the old owner. For an asset that will be sold and depreciated more than twice, backward recursion can be used to find its initial value from the after-tax revenue streams of its successive owners.

the price a buyer would be willing to pay for a used asset is less than under ideal accounting, However, if the remaining economic life is more than the depreciation life, the price a buyer would be willing to pay for a used asset is more than under ideal accounting because the second owner is in essentially the same position as the first owner. He or she will be able to capture the full tax benefit of depreciation over less than the asset's full life and then sell the asset to a third owner.

Case 2: Gain all Taxed as Ordinary Income

When the original owner sells an asset, the net revenue stream can be divided into five components: the initial cost of the asset, the stream of revenue from the asset, the stream of tax on revenue less costs, the sales price of the asset, and the tax on the gain realized from selling the asset. The gain is the difference between the sales price and the basis at the time of the sale. In most cases, basis will equal the purchase price less accumulated depreciation, $K - \int_0^{\hat{T}} \frac{K}{T_1} dt$, so that the gain will be

$$P_{\hat{T}} - \left(K - \int_0^{\hat{T}} \frac{K}{T_1} dt\right) = P_{\hat{T}} - K - K\frac{\hat{T}}{T_1} = P_{\hat{T}} - K\left(1 - \frac{\hat{T}}{T_1}\right).$$

Under U.S. law, when a gain is less than accumulated depreciation, all of the gain generally is taxed as ordinary income. In this case, the present value of net revenue from buying, holding, and reselling an asset is

$$(37) \quad PV_{AD2} = -K + \int_0^{\hat{T}} Re^{-rt} dt - \int_0^{\hat{T}} \tau\left(R - \frac{K}{T_1}\right) e^{-rt} dt + P_{\hat{T}} e^{-r\hat{T}} - \tau_c\left(P_{\hat{T}} - K\left(1 - \frac{\hat{T}}{T_1}\right)\right) e^{-r\hat{T}}.$$

Integrating, rearranging, and substituting (36) for $P_{\hat{T}}$ gives

$$(38) \quad PV_{AD2} = (1-\tau)R\frac{\left(1 - e^{-r\hat{T}}\right)}{r} - K\left(1 - \frac{\tau}{T_1}\frac{\left(1 - e^{-r\hat{T}}\right)}{r}\right) + \frac{(1-\tau)(1-\tau_c)R\left(e^{-r\hat{T}} - e^{-rT}\right)}{\left(r - \frac{\tau}{T_1}\left(1 - e^{-r(T-\hat{T})}\right)\right)} + \tau_c K\left(1 - \frac{\hat{T}}{T_1}\right) e^{-r\hat{T}}.$$

The difference between the present value of net revenue in this case and in the base case is

$$(39)\quad PV_{AD2} - PV_0 = \tau K\left[\frac{1}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r} - \frac{1}{T}\frac{\left(1-e^{-rT}\right)}{r}\right] + (1-\tau)R\left(e^{-r\hat{T}} - e^{-rT}\right)\left[\frac{(1-\tau_c)}{\left(r - \frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)} - \frac{1}{r}\right] + \tau K\left(1-\frac{\hat{T}}{T_1}\right)e^{-r\hat{T}}$$

The first term in (39) is similar to (34), and is the value of the subsidy from accelerated depreciation up to the time of resale. The second term is the after-tax sales price of the asset, and the third is the tax benefit of deducting the basis from the sales price.

Case 3: Gain up to Accumulated Depreciation Taxed as Ordinary Income

For some types of assets, the gain up to accumulated depreciation of $K\frac{\hat{T}}{T_1}$ is taxed as ordinary income and any gain over accumulated depreciation is taxed as capital gains income. The gain taxed at the capital gains rate is $P_{\hat{T}} - K\left(1-\frac{\hat{T}}{T_1}\right) - K\frac{\hat{T}}{T_1} = P_{\hat{T}} - K$, i.e. the difference between the sales price and the initial cost.

The present value of the net revenue stream from an asset now has six components: the initial purchase price, the present value of revenue up to the sale date, the present value of taxes up to the sale date, the sale price, taxes at the ordinary income rate on gains up to accumulated depreciation, and taxes at the capital gains rate on gains in excess of accumulated depreciation. The present value of the net revenue stream is

$$(40)\quad PV_{AD3} = -K + \int_0^{\hat{T}} Re^{-rt}dt - \int_0^{\hat{T}} \tau\left(R - \frac{K}{T_1}\right)e^{-rt}dt + P_{\hat{T}}e^{-r\hat{T}} - \tau K\frac{\hat{T}}{T_1}e^{-r\hat{T}} - \tau_C(P_{\hat{T}} - K)e^{-r\hat{T}}.$$

Integrating, substituting (36) for $P_{\hat{T}}$, and rearranging gives

$$(41)\quad PV_{AD3} = (1-\tau)R\frac{\left(1-e^{-r\hat{T}}\right)}{r} - K\left(1-\frac{\tau}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r}\right)$$
$$+\frac{(1-\tau_C)(1-\tau)R\left(e^{-r\hat{T}}-e^{-rT}\right)}{\left(r-\frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)} + K\left(\tau_C-\tau\frac{\hat{T}}{T_1}\right)e^{-r\hat{T}}.$$

In this case, the subsidy is

$$(42)\quad PV_{AD3} - PV_0$$
$$= (1-\tau)R\frac{\left(e^{-rT}-e^{-r\hat{T}}\right)}{r} + \tau K\left[\frac{1}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r} - \frac{1}{T}\frac{(1-e^{-rT})}{r}\right]$$
$$+\frac{(1-\tau_C)(1-\tau)R\left(e^{-r\hat{T}}-e^{-rT}\right)}{\left(r-\frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)} + K\left(\tau_C-\tau\frac{\hat{T}}{T_1}\right)e^{-r\hat{T}}.$$

The difference from (39) is

$$(43)\quad PV_{AD3} - PV_{AD2} = -(\tau-\tau_C)Ke^{-r\hat{T}},$$

which is the difference between the tax rates for ordinary income and capital gains income multiplied by the present value of the part of the gain taxed at the lower capital gains rate.

Case 4: Gain all Taxed as Capital Gains Income
If all of the gain is taxed at the capital gains rate, the present value of net income is

$$(44)\quad PV_{AD4} = -K$$
$$+\int_0^{\hat{T}} Re^{-rt}dt$$
$$-\int_0^{\hat{T}} \tau\left(R-\frac{K}{T_1}\right)e^{-rt}dt + P_{\hat{T}}e^{-r\hat{T}} - \tau_C\left[P_{\hat{T}} - \left(K-\int_0^{\hat{T}}\frac{K}{T_1}dt\right)\right]e^{-r\hat{T}}.$$

Integrating and simplifying gives

$$(45)\quad PV_{AD4} = (1-\tau)R\frac{\left(1-e^{-r\hat{T}}\right)}{r} - K\left(1-\frac{\tau}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r}\right) + (1-\tau_C)P_{\hat{T}}e^{-r\hat{T}} + \tau_C\left(1-\frac{\hat{T}}{T_1}\right)Ke^{-r\hat{T}}$$

Compared to (31), the present value of after-tax revenue is calculated over the time up to the asset's sale rather than its life, the present value of depreciation deductions is calculated over the time up to the sale rather than over the depreciation life, and there are two new terms, which give the present value of the after-tax capital gain. The first of these is the present value of the after-tax sales price. The second is the present value of the tax benefit of the seller's remaining basis, which is subtracted from the sales price to calculate the taxable gain.

Substituting (36) into (45) gives

$$(46)\quad PV_{AD4} = (1-\tau)R\frac{\left(1-e^{-r\hat{T}}\right)}{r} - K\left(1-\frac{\tau}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r}\right) + \frac{(1-\tau_C)(1-\tau)R\left(e^{-r\hat{T}}-e^{-rT}\right)}{\left(r-\frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)} + \tau_C\left(1-\frac{\hat{T}}{T_1}\right)Ke^{-r\hat{T}}$$

The subsidy from the combination of accelerated depreciation, the buyer's ability to restart depreciation, and taxation of the resulting gain at a preferential rate is

$$(47)\quad PV_{AD4} - PV_0 = (1-\tau)R\frac{\left(1-e^{-r\hat{T}}\right)}{r} - K\left(1-\frac{\tau}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r}\right) + \frac{(1-\tau_C)(1-\tau)R\left(e^{-r\hat{T}}-e^{-rT}\right)}{\left(r-\frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)} + \tau_C\left(1-\frac{\hat{T}}{T_1}\right)Ke^{-r\hat{T}} - \left\{(1-\tau)R\frac{(1-e^{-rT})}{r} - K\left(1-\frac{\tau}{T}\frac{(1-e^{-rT})}{r}\right)\right\},$$

which can be reduced to

$$(48)\quad PV_{AD4}-PV_0$$
$$=(1-\tau)R\frac{\left(e^{-rT}-e^{-r\hat{T}}\right)}{r}+\tau K\left[\frac{1}{T_1}\frac{\left(1-e^{-r\hat{T}}\right)}{r}-\frac{1}{T}\frac{(1-e^{-rT})}{r}\right]$$
$$+\frac{(1-\tau_C)(1-\tau)R\left(e^{-r\hat{T}}-e^{-rT}\right)}{\left(r-\frac{\tau}{T_1}\left(1-e^{-r(T-\hat{T})}\right)\right)}+\tau_C\left(1-\frac{\hat{T}}{T_1}\right)Ke^{-r\hat{T}}.$$

The first three terms are the same as the first three terms in (42). The difference between (48) and (42) is

$$(49)\quad PV_{AD4}-PV_{AD4}=K\frac{\hat{T}}{T_1}e^{-r\hat{T}}(\tau-\tau_C),$$

which is the difference between the tax rates on ordinary income and capital gains income multiplied by the present value of accumulated depreciation. Thus, taxing capital gains income at a preferential rate increases the distortion from deferring taxation.

Sweat Equity Distorts Investment Choices Toward Capital Gains Assets

Conclusions

1. Business owners often perform services for the business that increase the value of the business. Under ideal accounting, an amount equal to the business owner's market wage would be attributed to the business owner as income for each hour worked for the business, and the same amount would be attributed to the business as a cost. Any difference between the employer's market wage and the amount actually paid would be counted as a contribution to capital. In reality, a business owner can make off-the-books contributions of capital to the business by performing services that increase the value of the business and taking either no compensation or compensation that is less than the market value of the owner's time. If the owner sells part or all of the business, there will be capital gains income, but no economic capital gain, because the owner's basis is understated. This defers taxes on the owner's income from the time when he or she should have received income from performing services to the time when part or all of the business is sold.

2. This deferral of taxes provides an incentive for business owners to invest in their business by providing unpaid labor, even when the value of the owner's time is more than

the cost of purchasing the same services. The incentive is larger if the deferred income is taxed at a lower capital gains rate.

Demonstration

Suppose a taxpayer is starting a new professional practice or other business to be organized as a pass-through entity or sole proprietorship. There is a startup phase where, from t=0 to t=T_S, the firm is building up the stock of assets needed to be successful in its line of business but has no revenue. After the startup period, net revenue will equal the market wage the proprietor could earn working full time plus the market return on the market value of the business' capital stock. During the startup period, the owner can choose between working full time at the market wage and purchasing all startup inputs or working part-time at the market wage and using the remainder of his or her time to produce some of the capital assets for the business.

Let w be the market wage. Let K be the capital required for the business. For simplicity, the firm is assumed to reinvest an amount equal to economic depreciation every period and deduct that amount as an expense in calculating net income. Thus, depreciation does not need to be shown explicitly. Let r be the market rate of return, which is also equal to the business owner's discount rate. Assume that the owner will retire and sell the business as a going concern at time T.

If the owner chooses to work full time and purchase all the startup inputs, the present value of after tax income is

$$(50) \quad PV_0 = \int_0^{T_s} (1-\tau) w e^{-rt} dt - \int_0^{T_s} \frac{K}{T_s} e^{-rt} dt + \int_{T_s}^{T} (1-\tau)(w + rK) e^{-rt} dt \\ + (1-\tau_c)(K-K)e^{-rT},$$

where the first term is the present value of wages earned during startup, the second is the present value of investment costs during startup, the third term is the present value of income during the time the owner operates the business, and the fourth term is the present value of capital gains income from the sale of the business. The last term is zero because the owner's basis equals the value of the assets.

Alternatively, the owner may choose to spend a fraction, α, of his or her working time doing outside work and to spend the rest making uncompensated contributions to the business' capital by self-producing some of the startup inputs. Let βK units of the startup capital be purchased and (1-β)K be self-produced.

Ideal accounting would require that the business pay the owner the market wage for time spent working for the business in the startup phase and that the owner's basis be the fair market value of the business' assets. In this case, the present value of after tax income would be

$$(51)\quad PV_A = \int_o^{T_s} (1-\tau)we^{-rt}dt - \int_0^{T_s} \left(\frac{\beta K}{T_s} + (1-\alpha)w\right) e^{-rt}dt + \int_{T_s}^{T} (1-\tau)(w+rK)e^{-rt}dt + (1-\tau_c)(K-K)e^{-rT}$$

The difference is

$$(52)\quad PV_A - PV_0 = \left(\frac{K-\beta K}{T_S} - (1-\alpha)w\right)\int_0^{T_S} e^{-rt}dt = \left((1-\beta)\frac{K}{T_S} - (1-\alpha)w\right)\frac{(1-e^{-rT_S})}{T_s}.$$

$PV_A - PV_0 < 0$ as long as $(1-\alpha)w > (1-\beta)K/T_S$, i.e. the cost of self-producing part of the startup inputs, with the owners time valued at the market wage, is more than the cost of buying the same inputs.

With less than ideal accounting, the owner's time spent self-producing startup inputs is not compensated and appears to be free to the business. The owner's basis in the business' assets is just the cost of the purchased capital. In this case, the present value of after tax income is

$$(53)\quad PV_1 = \int_0^{T_s} (1-\tau)\alpha we^{-rt}dt - \int_0^{T_s} \frac{\beta K}{T_s} e^{-rt}dt + \int_{T_s}^{T} (1-\tau)(w+rK)e^{-rt}dt + (1-\tau_c)(K-\beta K)e^{-rT}.$$

The four terms have the same interpretation as in (51) except that the first and second terms exclude the owner's uncompensated labor, both as a source of income and as a cost to the business, and the last term, which shows the present value of after-tax capital gains income from selling the business, is not zero because the basis does not reflect the true value or cost of the business' assets.

The difference from the case were all startup inputs are purchased is

$$(54)\quad PV_1 - PV_0 \\ = -(1-\alpha)(1-\tau)w\int_0^{T_S} e^{-rt}dt \\ + (1-\beta)\frac{K}{T_S}\int_{T_S}^{T} e^{-rt}dt + (1-\tau_c)(K-\beta K)e^{-rT}$$

Integrating and simplifying gives

$$(55)\quad PV_1 - PV_0 = (1-\beta)K\left[\frac{(1-e^{-rT_S})}{rT_S} + (1-\tau_c)e^{-rT}\right] - (1-\alpha)(1-\tau)w\frac{(1-e^{-rT_S})}{r}.$$

This difference has three components, the present value of startup costs that were kept off the books, the present value of after-tax capital gains income when the business is sold, and the present value of after tax wages foregone during the startup phase. Whether this difference is positive depends on the relative sizes of $(1-\beta)K$, the initial investment kept off the books, and$(1-\tau)w(1-\alpha)$, the after tax wages foregone by spending time self-producing startup inputs. If the business owner is good enough at self-producing inputs it makes sense to do so. Note that the business owner's cost of self-producing the startup inputs does not need to be less than their market price, because keeping part of the firm's capital stock off the books defers the tax on the income the owner should have paid himself for producing it and taxes it at the lower capital gains rate.

The Effects of Multiple Departures from Neutral Taxation

Capital gains income from the sale of an interest in a business, whether the business is a C-corporation or a pass-through entity, usually will result from a combination of multiple one-time gains or losses from new information, understated basis from retained earnings or uncompensated contributions of capital, and inflation.

Conclusions

1. Existing taxation of capital gains income in the U.S. involves several distortions of investors' choices between assets that pay all of their returns as ordinary income and assets that pay part or all of their returns as capital gains income. Not adjusting basis for inflation favors investments paying ordinary income. Taxing on realization favors

investments that provide capital gains income. Deferring taxes through excess depreciation or off-the-books capital contributions sometimes favors investments paying capital gains income. Whether the net effect favors investments that pay capital gains income or investments that pay ordinary income depends on the circumstances.

2. With distortions that act in opposing directions, it is not clear whether eliminating or reducing one distortion will lead to an improvement. For example, adjusting basis for inflation will make the tax system more neutral if capital gains income is primarily due to inflation. However, if capital gains income is primarily due to accounting rules that defer taxation and convert ordinary income to capital gains income, adjusting basis for inflation would make the tax system less neutral.

In the U.S., current federal law gives capital gains income preferential tax treatment through lower rates. Of the 41 states with a comprehensive income tax, twelve have partial exemptions for capital gains income, either for all gains or for specific types of gains, and two have lower rates for capital gains income. This introduces another distortion which favors investments paying capital gains income over investments paying ordinary income. The only possible justification for an additional distortion in this direction would be if the net of other distortions went the other way.

Demonstration

Suppose a closely held corporation has a stable, reliable line of business that produces real net income at the rate R_0, i.e. its nominal revenue at time t will be R_0e^{ct} into the indefinite future. The company currently distributes all its net revenue as dividends. The shareholders are planning to have the company enter a new line of business. This will require an investment of K at time 0. To simplify the math, assume that $K \le R_0$.[20] The investment will be made with funds from the existing shareholders.[21] They can contribute additional capital either by buying new shares or by having the corporation retain earnings.

The results of the investment are uncertain. Suppose, for simplicity, that either the company will establish a new, stable line of business producing constant additional real revenue of R_1e^{ct} or that the new line of business will be a failure and produce no revenue. The probability of a successful outcome is π, and the probability of failure is $(1-\pi)$. Whether the new line of business is successful will be known immediately after making the investment. If it is successful, the additional revenue will begin immediately

[20] This avoids having to track funds that the firm retains and earns interest on to finance a future investment.

[21] This assumption is made to avoid issues of how to allocate costs and revenue to old and new shareholders. With realization-based taxation of capital gains, existing and new shareholders may face different incentives, which may affect investment decisions. Interesting preliminary results can be found in Norman Schürhoff, Capital Gains Taxes, Irreversible Investment, and Capital Structure, International Center for Financial Asset Management and Engineering, Research Paper No. 131, February 2005 and Rainer Niemann and Caren Sureth, Investment Effects of Capital Gains Taxation Under Simultaneous Investment and Abandonment Flexibility, Diskussionsbeitrag Nr. 77, Arbeitskreis Quantitative Steuerlehre, 2009. However, their results are derived in very restrictive models, and it is not clear whether they can be generalized.

If the investment is financed by having existing owners buy additional shares, the expectation of the present value of after-tax net revenue received by shareholders is

$$(56) \quad EPV_0 = -K + \pi \int_0^{\infty} (1-\tau)(1-\tau_K)(R_0 + R_1)e^{ct}e^{-rt}dt + (1-\pi)\int_0^{\infty}(1-\tau)(1-\tau_K)R_0 e^{ct}e^{-rt}dt.$$

The first term is the investment cost. The second term is the present value of after-tax net revenue if the investment pays off multiplied by the probability of success. The third term is the present value of after-tax net revenue from the existing line of business multiplied by the probability that the new line of business will fail.

Integrating and simplifying gives

$$(57) \quad EPV_0 = -K + (1-\tau)(1-\tau_K)\frac{1}{\rho}(R_0 + \pi R_1),$$

where ρ is the real discount rate, r – c.

If the investment is financed from retained earnings and the owners later sell their shares there are three major components to the expectation of the present value of the owners' after-tax income. The first is the after-tax cost of the investment to the shareholders. Earnings that the corporation retains to make the investment are subject to the corporate tax but not to the individual income tax, because they are not distributed to the owners as dividends. When the corporation reduces dividends by K, this reduces shareholders' after-tax income by

$$(1-\tau)K,$$

which is the owners' after-tax cost of the investment.

The second component is the expectation of the present value of the owners' after-tax income after the investment takes effect and before they sell their shares. Let T_{S1} be the date when the owners sell if the investment is successful and T_{S0} be the date when they sell if the investment is unsuccessful. The present value of after-tax income the owners receive in the successful case is

$$\int_0^{T_{S1}} (1-\tau)(1-\tau_K)(R_0+R_1)e^{ct}e^{-rt}dt.$$

In the unsuccessful case, it is the same except that T_{S1} is replaced by T_{S0} and R_1 is replaced by 0. Each of these present values is multiplied by the probability that it occurs.

The third major component is the expectation of the after tax gain from selling the company. This is the present value of the sales price less the present value of the tax on the gain. The sales price will be the present value, at the sales date, of future after-tax income from the firm. If the investment is successful, this is

$$\int_{T_{S1}}^{\infty} (1-\tau)(1-\tau_K)(R_0+R_1)e^{ct}e^{-r(t-T_{S1})}dt.$$

In this expression, the nominal revenue streams include inflation from date 0, but this revenue is only discounted back to the sale date, T_{S1}. If the investment is unsuccessful, this present value is the same, except that T_{S1} is replaced by T_{S0} and R_1 is replaced by 0.

The tax on the gain is the capital gains tax rate τ_C multiplied by the difference between the sales price and the owners' basis. If we assume away pre-existing unrealized gains or losses, the current owners' basis should be the present value, at time 0, of after-tax revenue without the new investment. This is

$$\int_0^{\infty} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-rt}dt.$$

Combining these components gives

$$
\begin{aligned}
(58)\quad EPV_1 = {} & -(1-\tau)K + \pi \int_0^{T_{S1}} (1-\tau)(1-\tau_K)(R_0+R_1)e^{ct}e^{-rt}dt \\
& + (1-\pi)\int_0^{T_{S0}} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-rt}dt \\
& + \pi e^{-rT_{S1}} \left\{ \int_{T_{S1}}^{\infty} (1-\tau)(1-\tau_K)(R_0+R_1)e^{ct}e^{-r(t-T_{S1})}dt \right. \\
& - \tau_C \left[\int_{T_{S1}}^{\infty} (1-\tau)(1-\tau_K)(R_0+R_1)e^{ct}e^{-r(t-T_{S1})}dt \right. \\
& \left.\left. - \int_0^{\infty} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-rt}dt \right] \right\} \\
& + (1-\pi)e^{-rT_{S0}} \left\{ \int_{T_{S0}}^{\infty} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-r(t-T_{S0})}dt \right. \\
& - \tau_C \left[\int_{T_{S0}}^{\infty} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-r(t-T_{S0})}dt \right. \\
& \left.\left. - \int_0^{\infty} (1-\tau)(1-\tau_K)R_0 e^{ct}e^{-rt}dt \right] \right\}.
\end{aligned}
$$

Integrating and simplifying gives

$$
\begin{aligned}
(59)\quad EPV_1 = {} & -(1-\tau)K \\
& + (1-\tau)(1-\tau_K)R_0 \left\{ \frac{1}{\rho} - \pi\tau_C \frac{(e^{-\rho T_{S1}} - e^{-rT_{S1}})}{\rho} \right. \\
& \left. - (1-\pi)\tau_C \frac{(e^{-\rho T_{S0}} - e^{-rT_{S0}})}{\rho} + (1-\tau)(1-\tau_K)\pi R_1 \left\{ \frac{1}{\rho} - \tau_C \frac{e^{-\rho T_{S1}}}{\rho} \right\} \right\}.
\end{aligned}
$$

The difference between the expected present value with financing from retained earnings and with financing by issuing new shares is fairly complicated:

$$(60)\quad EPV_1 - EPV_0 \\ = \tau K - (1-\tau)(1-\tau_K)R_1\pi\tau_C\frac{e^{-\rho T_{S1}}}{\rho} \\ - (1-\tau)(1-\tau_K)R_0\left\{\pi\tau_C\frac{e^{-\rho T_{S1}} - e^{-rT_{S1}}}{\rho} + (1-\pi)\tau_C\frac{e^{-\rho T_{S0}} - e^{-rT_{S0}}}{\rho}\right\}.$$

However, as in the simpler case with a one-time gain from new information, taxpayers have an incentive to realize losses immediately and defer realizing gains indefinitely. Setting the sale time if the investment is successful, T_{S1}, to infinity, and setting the sale time if the investment is a failure, T_{S0}, to zero reduces equation (60) to

$$(61)\quad EPV_1 - EPV_0 = \tau K.$$

The gain from financing with retained earnings and then holding the stock if the investment is successful and selling if it is a failure is just the individual income tax on the retained earnings, which is deferred forever.

If the investment is unsuccessful, the share price should remain unchanged in real terms, since the original revenue stream will continue. However, in nominal terms, the share price should grow over time at the rate of inflation. The taxpayer will not have a real gain or a real loss, other than the cost of the failed investment, but if the taxpayer waits to sell the shares, he or she will have a taxable nominal gain. This will grow over time, and it is this prospect of paying tax when there is no real gain that provides the incentive to sell immediately if the investment is unsuccessful. If the taxpayer is unable or unwilling to sell immediately, this reduces the incentive for retained earnings.

If the taxpayer were to sell immediately whether the investment was successful or not, both T_{S1} and T_{S0} would be 0, and equation (60) would reduce to

$$(62)\quad EPV_1 - EPV_0 = \tau K - (1-\tau)(1-\tau_K)\pi R_1\frac{\tau_C}{\rho}.$$

The first term, again, is the value of deferring taxes forever on the income retained by the corporation. The second term is the present value of the additional income stream multiplied by the probability of success and the capital gains tax rate. This is the expected value of the capital gains tax that will be due if the shares are sold immediately.

Whether the net of these two terms is positive or negative depends on the three tax rates, the real discount rate, the probability that the investment will be successful, and the rate of return if the investment is successful, R_1/K.

There are three departures from neutral taxation at work here. Making off-the-books capital contributions through retained earnings converts current ordinary income to future capital gains income subject to a lower rate. Not adjusting basis for inflation creates a nominal gain when there is no real gain and overstates the gain when there is a real gain. Taxing gains on realization allows taxpayers to realize, and deduct, losses immediately and defer taxation of gains, perhaps forever. If taxpayers have no goals other than maximizing the expectation of the present value of revenue from a single investment, the net effect is to distort investors' choices in the direction of investment through retained earnings. If taxpayers have other goals, such as balancing a portfolio, or face other constraints, so that they do not realize losses immediately and defer gains indefinitely, the net direction of the distortion is unclear.

5. Summary and Policy Implications

A taxpayer has capital gains income (or a loss) when he or she sells an asset for more (less) than its book value. In general, capital gains income (or a loss) may have up to three components: an economic capital gain or loss due to new information, anticipated changes in market conditions, or natural growth; an accounting gain due to accelerated depreciation, off-the-books contributions of capital to a business, or other accounting conventions that do not match economic reality; and a nominal gain due to inflation. In all cases, capital gains income includes an inflation component. In most cases it includes a component due to non-ideal accounting. In many cases, there is no economic capital gain.

For taxation not to bias the choice between assets that give a regular stream of returns and assets that yield part or all of their return in the form of capital gains, capital gains income would have to be taxed (and losses fully deducted) as they accrue, at the same rate as income from non-capital-gains assets, with accounting depreciation equal to economic depreciation and basis adjusted for inflation. Alternatively, capital gains income could be taxed (and losses deducted) when it is realized, with accounting depreciation equal to economic depreciation and basis adjusted for inflation, and with interest from the time the gain or loss accrued.

In the U.S., capital gains income is taxed on realization with accounting depreciation (which often is accelerated), no inflation adjustment, and no interest since accrual. In general, taxing on realization with no interest and accelerated depreciation subsidizes assets that provide capital gains income compared to assets that yield ordinary income. Preferential rates provide an additional subsidy. Not adjusting basis for inflation disadvantages assets that provide capital gains income. Which effect is stronger depends on circumstances. However, there is no general case that can be made for preferential rate treatment of capital gains income.

If it were empirically established that the bias against capital gains assets due to not adjusting for inflation is stronger than the combined biases in their favor, some compensating adjustment to the tax structure might be justified. However, preferential rates or partial exemptions are blunt tools for accomplishing this purpose. The inflationary component of capital gains income, and the resulting bias, is larger the longer an asset is held and the higher the rate of inflation. Preferential rates and partial exemptions give the same advantage to all gains, regardless of the holding period. It would be better, and relatively easy, to require (or allow) taxpayers to adjust the initial cost for inflation.

A strong case can be made for taxing gains on a mark-to-market basis where that is practical, for reforming the accounting treatment of corporate retained earnings, and for tightening other rules for off-the-books capital contributions. If those changes were made, it probably would make sense to adjust basis for inflation when that is practical. Without these other changes, adjusting basis for inflation is likely to increase rather than reduce distortions.