Chapter 11
MICROECONOMIC APPROACH TO TEACHING TAXATION

Jerrold J. Stern
Indiana University

This chapter describes and illustrates in detail selected concepts of the microeconomic approach from a teaching point of view. The purpose of the high level of detail is to facilitate ease of understanding and to demonstrate "teachability"—especially for undergraduates. Several sources for teaching materials are also discussed.

OVERVIEW

The microeconomic approach provides a comprehensive perspective for evaluating how taxes affect the business decisions made by individuals and firms. It emphasizes that tax planning is an integral part of the decision-making process. Thus, before "tax planning" can be defined, one must first acknowledge that the goal of individuals and firms is to maximize after-tax value. Operationally, this goal is achieved by maximizing the after-tax profitability on transactions. Given this objective function, "efficient tax planning" is defined as the process of identifying strategies that maximize after-tax profitability. As discussed below, after-tax profitability is calculated with present values, future values, and/or internal rates of return based on after-tax cash flows from transactions.

The objective of teaching the microeconomic approach is to give students the opportunity to learn its key concepts and how to apply them to decisions in which current or future taxes play a role. This approach is also useful for assessing potential policy ramifications of current and prospective tax rules.

Some refer to the microeconomic approach as the "Scholes/Wolfson Tax Planning Framework." Scholes[1] and Wolfson (1992) describe their framework and provide applications to business contexts in their award-winning text,[2] *Taxes and Business Strategy*. The generic term "microeconomic approach" has become popular since the framework integrates several subject areas (taxation, accounting, finance, microeconomics, and management) and because it focuses on

---

[1] Professor Scholes is a co-recipient of the 1997 Nobel Prize in Economics, presented to recognize the significant contribution of the Black-Scholes Option Pricing Model.

[2] The text is the winner of the 1992 American Accounting Association Notable Contributions to Accounting Literature Award.

Jerrold J. Stern is a Professor at Indiana University.
I thank Jim A. Seida for helpful comments.

individual-level and firm-level decisions rather than macroeconomic issues. The second edition of the text was published in 2001 (Scholes et al.). In addition to Professors Scholes and Wolfson, new co-authors are Professors Merle Erickson, Edward Maydew, and Terry Shevlin.

There are many benefits from learning efficient tax-planning skills via the microeconomic approach, including (1) identifying which tax-planning options exist and which one is optimal, (2) learning how various segments of the economy operate, (3) building a tool kit of skills for dealing with an ever-changing tax environment, (4) assessing tax policy,[3] and (5) acquiring a broad perspective for analyzing tax law changes, such as predicting effects of tax law changes on asset prices, compensation contracts, business entity choices (e.g., corporation, partnership, limited liability company), investment preferences, and the like.

With regard to analyzing tax law changes, the microeconomic approach recognizes that all such changes involve turning two kinds of dials—level of tax rates and relative tax rates. Moreover, these dials affect different taxpaying units (e.g., individuals, corporations, partnerships, estates, trusts), different tax periods for the same taxpayer (e.g., individuals—early career, mid-career, new career, retirement; corporations—low-income start-up years, profitable years, loss years), and different economic activities for the same taxpayer during the same time period (capital gains tax rates are lower than ordinary tax rates on sales of investments and certain business assets while ordinary tax rates apply to salary, commissions, and self-employment income).

Regardless of whether a business student's career interests are in accounting, studying the microeconomic approach is beneficial. Students interested in becoming tax specialists obtain an appreciation of where tax law complexities fit within the context of business and investment decisions. Students oriented toward other accounting or business careers gain an awareness of how taxes play a role in decision making (i.e., investment in plant/equipment, business expansion/contraction, risk taking). Students seeking careers as social planners become better equipped to design effective policies to motivate desired social behaviors (e.g., charitable giving) and discourage other behaviors (e.g., environmental pollution). The intent of teaching the microeconomic approach is to prepare students to be leaders rather than followers in understanding how business and investment activities inevitably reorganize as tax rules evolve.

MICROECONOMIC PARADIGM

The microeconomic approach can be viewed as a tool kit for applying efficient tax planning to make optimal tax strategy selections—it helps tax planners identify which options exist and which one is best. The microeconomic approach is composed of three elements: (1) a set of algebraic equations (analytical models), (2) subjective and other factors not included in the equations, and (3) descriptions of rules and concepts. Key aspects of these are described and illustrated below.[4]

Concepts

Efficient tax planning is the process of selecting tax strategies that maximize after-tax profitability. At the heart of measuring after-tax profitability is identifying after-tax cash flows (ATCF).

After-Tax Cash Flow Model

To illustrate the ATCF model, consider an investor who purchases a corporate bond for $1,000. The interest rate is 10 percent and the taxpayer's marginal tax rate is 40 percent. In the context of the ATCF model, the income from this investment is as shown in Exhibit 1.

---

[3] Tax laws often affect the behavior of individuals and firms in ways not contemplated by legislators. The microeconomic approach helps to predict behavior, thereby helping ensure tax policy objectives are met.

[4] Most of this section is adapted directly from Chapters 1, 2, and 3 of Stern and Seida (2000). In turn, most of chapters 1 and 3 of Stern and Seida derive from chapters 1, 3, and 5 of Scholes and Wolfson (1992).

EXHIBIT 1
After-Tax Cash Flow Model

	Δ Taxable income (loss)	$100
	Δ BTCF (before-tax cash flow)	$100
+/−	Δ Explicit tax ($100 × .40)	(40)
	Δ ATCF (after-tax cash flow)	$60

Note the change in before-tax cash flow (Δ BTCF). The investor receives an interest check for $100 from the corporation that sold the bond. Thus, $100 is the change in the investor's before-tax cash flow during the period as a result of investing in the bond. By definition, the Δ BTCF is the amount of cash received (or paid) before considering tax effects. One can also think of the Δ BTCF as the debit (or credit) accounting entry that would be made to the cash account if there were no tax effects. Alternatively, the Δ BTCF can be viewed as the increase (decrease) in a checking account as a result of receiving (paying) cash on a transaction before considering tax effects.

The tax law classifies bond interest received from corporate bonds as taxable income. Thus, the bond interest produces a change in (Δ) taxable income by increasing it $100. As a result, additional tax will be paid on $100 of additional taxable income.

In this example, the change in before-tax cash flow ($100) is the same amount as the change in taxable income. For some transactions, but not all, Δ BTCF equals Δ taxable income.

The Δ explicit tax is the increase (decrease) in taxes paid directly to the tax collector as a result of the Δ taxable income (loss). In contrast, implicit taxes are taxes paid indirectly in the form of lower annual before-tax rates of return on tax-favored investments. In the bond example, above, $40 is the increase in explicit tax paid to the tax collector calculated at tax rate t, or 40 percent.

To compute Δ ATCF (change in after-tax cash flow), the $40 increase in explicit tax is subtracted from $100 BTCF to compute $60 ATCF. Alternatively, a decrease in explicit tax (i.e., due to tax savings from a tax deduction) is added to BTCF to compute ATCF.

The after-tax cash flow model is very powerful because it can be used to guide the analysis of either simple or complex transactions. For example, it is useful in analyzing the simple bond example above as well as in examining leasing transactions, compensation alternatives, or foreign investments. A complicated transaction may produce various types of taxable income and/or losses. It may have many types of before-tax cash flows (e.g., revenues, brokers' fees, legal expenses, information costs). It could affect different types of tax liabilities (e.g., federal income tax, employment tax, state income tax, property tax). Yet, regardless of the level of complexity, each element of the transaction can be categorized as Δ taxable income (loss), Δ BTCF, and/or Δ tax.

In straightforward transactions, like the bond example, the Δ ATCF can be computed using a short-cut method—called the "short-cut ATCF model." For this method to work, the Δ taxable income (loss) must equal the Δ BTCF. If not, the regular ATCF model must be used. The short-cut ATCF model is below. Note that t represents the marginal tax rate.

$$\text{BTCF}\,(1 - t) = \text{ATCF}; \qquad (1)$$
$$\$100\,(1 - .40) = \$60.$$

The annual after-tax rate of return is sometimes abbreviated as the annual after-tax ROR, or

AATROR. One way to compute the AATROR was illustrated earlier in connection with the bond example. The bond's AATROR is 6 percent, computed as follows:

$$\text{Annual after-tax rate of return} = \frac{\text{ATCF } \$60}{\text{Investment } \$1{,}000} = 6\%. \qquad (2)$$

In contrast to the annual after-tax rate of return, the annual rate of return before considering taxes paid to the tax collector can be calculated as well. For the bond example, above, the annual before-tax rate of return (ABTROR) is 10 percent. It is the stated interest rate. In the bond example, the interest rate was given. It can be calculated as follows:

$$\text{Annual before-tax rate of return} = \frac{\text{BTCF } \$100}{\text{Investment } \$1{,}000} = 10\%. \qquad (3)$$

Measuring After-Tax Profitability

As noted earlier, the objective of efficient tax planning is to maximize the value of the firm by maximizing the after-tax profitability on transactions. This objective can be accomplished in three steps. First, identify tax-strategy alternatives by applying the microeconomic approach. Second, compute and compare after-tax profitability of alternatives. Note that the second step considers quantifiable tax and nontax factors as well as subjective tax and nontax factors. Third, select the alternative that provides the largest after-tax profitability in light of all quantifiable and subjective factors.

There are three methods for computing and comparing after-tax profitability among alternatives. They can be used to analyze alternatives that span one year or multiple years. Tax planners can compare the present value, future value, or after-tax internal rate of return (ATIRR) based on after-tax cash flows.

Why are there three methods of computing profitability? Under certain conditions one method may be preferable to another. For example, given the facts of the situation, it may be easier to compute a future value than an ATIRR. It may, however, be easier to compare ATIRRs than present values or future values of various alternatives. Sometimes computing both a future value and an ATIRR is helpful because two measures provide a more complete sense of how alternatives differ—i.e., a small difference in ATIRRs may result in a very large difference in future values.

Themes

To identify optimal tax strategies, tax planners must identify (1) all parties to transactions, (2) all tax costs and benefits associated with transactions, and (3) all nontax costs and benefits associated with transactions. These are the three major themes of the microeconomic approach.

All Parties. All parties to transactions must be identified to accomplish efficient tax planning. Once identified, each party's perspective, motivation, and economic circumstances (business, tax) should be assessed. At a minimum, business transactions typically have at least three parties—at least one buyer, at least one seller, and the tax collector(s) (Federal, state, local, and/or foreign government).

Two important implications of the above list should be highlighted. First, planners must consider the tax and nontax implications of a transaction from the perspective of all parties, not just from the perspective of the planner. This "all parties" perspective is also called a "global perspective." Viewing transactions solely from the vantage-point of the planner (called a "unilateral perspective") can lead to poor decisions, as illustrated below.

What are the benefits of a global perspective? A global perspective helps select the best party with which to contract. For example, consider the lease-vs.-buy decision. Taxpayers who have low marginal tax rates typically lease property from taxpayers with high marginal tax rates. The lessor obtains a higher tax benefit from depreciation deductions and part of this benefit may be shared with the lessee through lower lease payments.

The second implication of a global perspective is that the tax collector is an unwanted party to the transaction. Armed with this perspective, the buyer and seller may be able to structure a transaction to benefit each other while reducing the overall tax liability paid to the tax collector.

For example, universities are typically exempt from paying income taxes, while faculty pay tax on their university salaries. Faculty typically pay the university an annual parking fee that is not tax deductible. Given these facts, a university and its faculty can arrange a parking payment plan that benefits both the university and the faculty, while reducing taxes paid to the tax collector. Assume the annual parking fee is \$300. Further assume a typical professor's marginal tax rate is 40 percent. Since the \$300 parking fee is not deductible, faculty have to earn more than \$300 of salary (which is taxable at 40 percent) to pay their parking fee. But how much more? Using the short-cut ATCF model, and solving for SALARY provides the following:

$$\text{BTCF}\ (1 - \text{t}) = \text{ATCF} \tag{1}$$

$$\text{SALARY}\ (1 - \text{t}) = \text{AFTER-TAX SALARY} \tag{4}$$

$$\text{SALARY}\ (1 - .40) = \$300$$

$$\text{SALARY} = \$300/(1 - .40)$$

$$\text{SALARY} = \$500$$

The \$300 is the after-tax cash flow (ATCF, or alternatively, after-tax cost of parking) because this is the amount faculty must have available to pay for parking *after* paying tax on \$500 salary. As another way of expressing the same concept, the \$300 parking fee is paid with after-tax dollars (dollars that have already been subjected to tax). At a 40 percent marginal tax rate, faculty must earn \$500 of taxable salary to pay \$300 of nondeductible parking fees. Thus, a faculty member would be indifferent between the following options: Option 1—Keep faculty salary level constant and retain \$300 parking fee; and Option 2—Reduce faculty salary level by \$500 and charge no parking fee.

A university would prefer Option 2 because it would be \$200 better off—avoid paying \$500 salary and forgo collecting \$300 parking fee. Both the university and the faculty would be better off at the expense of the tax collector if the parking fee was eliminated and salary was reduced more than \$300 but less than \$500. For instance, if salary was reduced \$350, the after-tax reduction to each faculty member would be \$210 [\$350 (1 − .40)]. Faculty would be \$90 better off since they avoid a \$300 parking fee in exchange for giving up \$210 in after-tax earnings. The university would be \$50 better off because it saves \$350 of salary expense in exchange for forgoing a \$300 parking fee. The only party hurt by this plan is the tax collector, who loses \$140 (\$350 salary reduction that would have been taxed at 40 percent).[5]

All Tax Costs and Benefits. The second theme is that all tax costs and benefits need to be identified. As mentioned earlier, there are two types of tax costs. Explicit taxes are taxes paid directly to the tax collector. Implicit taxes are paid indirectly in the form of lower annual before-tax rates of return on tax-favored investments. In the bond example, above, \$40 is the explicit tax paid to the tax collector. An example of implicit taxes and a tax-favored investment is provided below.

---

[5] I.R.C. § 132(f)(4) specifically allows employees to receive free parking in exchange for reduced wages, which are excluded for income and employment tax purposes, effective for 1998 and later tax years. Admittedly, faculty who do not drive to work would be hurt by this plan. This small group of faculty could be made whole through some other arrangement. Social security taxes as well as state and local income taxes are not included in the above analysis. If included, the tax rate would be higher, enabling even greater savings to be shared by the university and faculty.

Tax benefits are savings that result from favorable tax rules. Most universities are not subject to taxation—they are tax-exempt. Clearly, this is a tax benefit that results in large tax savings. Sometimes, but not always, tax benefits result in implicit taxes. The example in Exhibit 2 illustrates implicit taxes associated with tax-exempt bonds. The example compares a fully taxable bond with a tax-exempt bond of equal risk.

For the investor in Exhibit 2, the tax-exempt bond is preferred to the fully taxable bond because it has a higher annual after-tax rate of return (due to a higher ATCF), 4 percent vs. 3.5 percent. Note that the short-cut ATCF formula (BTCF $(1 - t)$ = ATCF) does not work for tax-exempt bonds because (1) taxable income from tax-exempt bonds ($0) is not the same as BTCF ($40), and (2) $t = 30\%$, not 0.

What type of taxpayer would be indifferent between the taxable bond and the tax-exempt bond? Answer: A taxpayer with $t = 20$ percent. For such a taxpayer, ATCFs for taxable bonds and tax-exempt bonds would be equal.

Taxpayers with a tax rate of 20 percent in the previous example would be called "marginal investors" because they are indifferent between investing in the taxable bonds and tax-exempt bonds in the above example. Exhibit 3 shows the calculations.

Recall the definition of "implicit tax." Implicit taxes are taxes paid indirectly in the form of lower annual before-tax rates of return on tax-favored investments. The implicit tax on the tax-exempt bond is 1 percent, calculated as the difference in annual before-tax rates of return, as follows:

$$\begin{aligned} \text{Implicit tax on tax-exempt bond} &= R_b - R_m \\ &= 5\% - 4\% \\ &= 1\%. \end{aligned} \tag{5}$$

EXHIBIT 2

Comparison of Fully Taxable Bond with a Tax-Exempt Bond for a 30 Percent Tax Bracket Investor

Assumptions		
Tax rate (t) of investor	30%	
Bond assumptions:		
	Fully Taxable Bond	**Tax-Exempt Bond**
Principal	$1,000	$1,000
Interest rate	5%	4%
Interest income	$50	$40
Analysis		
Taxable income (loss)	$50	$0
BTCF	$50	$40
Explicit tax (t = 30%)	(15)	(0)
ATCF	$35	$40
Annual after-tax rate of return (AATROR)		
ATCF	$35	$40
Investment	$1,000	$1,000
AATROR	3.5%	4.0%

EXHIBIT 3
Marginal Investor
(t = 20%)

Assumptions		
Tax rate (t) of investor	20%	
Bond assumptions:		
	Fully Taxable Bond	**Tax-Exempt Bond**
Principal	$1,000	$1,000
Interest rate	5%	4%
Interest income	$50	$40
Analysis		
Taxable income (loss)	$50	$0
BTCF	$50	$40
Explicit tax (t = 20%)	(10)	(0)
ATCF	$40	$40
Annual after-tax rate of return (AATROR)		
ATCF	$40	$40
Investment	$1,000	$1,000
AATROR	4.0%	4.0%

where:

R_b = annual before-tax rate of return on the benchmark asset (the asset used for comparison purposes). In this case, the benchmark asset is the fully taxable bond; and

R_m = annual before-tax rate of return on the tax-exempt bond.

The 1 percent implicit tax on tax-exempt bonds results in a $10 implicit tax when the investment is $1,000 (1 percent of $1,000 is $10). If the investment were $25,000, the implicit tax would be $250 (1 percent of $25,000). The implicit tax (expressed either as a percentage of the investment or as a dollar amount of that investment) is the same for all taxpayers, regardless of their explicit marginal tax rate (t).

In contrast, the explicit tax depends on the explicit marginal tax rate of a specific investor. Expressed as a percentage of the investment, the explicit tax on the taxable bond for the marginal investor only is 1 percent, calculated as follows:

$$\begin{aligned}\text{Explicit tax on taxable bond} &= R_b - r_b \\ &= 5\% - 4\% \\ &= 1\%. \end{aligned} \qquad (6)$$

where:

r_b = annual after-tax rate of return on the benchmark asset.

By taking implicit and explicit taxes into account, the total tax cost can be identified. For tax-exempt bonds, the total tax cost is the same as for taxable bonds from the perspective of the marginal investor who has t = .20.

In general:	Implicit tax + Explicit tax = Total tax cost
For tax-exempt bond:	1% + 0% = 1%
For taxable bond:	0% + 1% = 1%

Are tax-exempt bonds the only tax-favored investments? No, but they are the easiest tax-favored investments to analyze. That is why they are used in basic examples.

In general, tax-favored investments have one or more of the following attributes: tax-exemption, preferential tax rates, deferral, immediate deduction and/or credit. Tax-exemption is illustrated above by the tax-exempt bond example. A typical example of preferential tax rates is the capital gains tax rate applied to gains from selling common stocks held more than one year. Deferral occurs when income is taxed one or more years after it is realized, such as with retirement investments like tax-deferred annuities and individual retirement accounts. Immediate deduction is a tax-favored attribute if the purchased asset or service provides benefits beyond one year, such as research and development, advertising, employee training programs, and immediate deduction of certain equipment. Deductions and tax credits can apply to the same transaction in the case of research and development, low income housing, and energy property.

Given the assumptions in the above examples, taxpayers with a 30 marginal percent tax rate prefer to invest in tax-exempt bonds and taxpayers with 20 marginal percent tax rates are indifferent between investing in tax-exempt bonds or taxable bonds. Do these findings indicate a general tendency? Yes, the findings reflect a "tax clientele" effect.

A tax clientele is a group of taxpayers that is attracted to certain investments and financing arrangements because of the taxpayers' similar explicit marginal tax rates. Typically, the term "explicit marginal tax rate" is synonymous with "marginal tax rate." The 20 and 30 percent marginal tax rates used in the computations above are examples of explicit marginal tax rates.

Many tax clienteles exist in the economy. For now, focus on two: high-tax-rate taxpayer clientele (i.e., $t > 20\%$) and low-tax-rate taxpayer clientele (i.e., $t < 20\%$).

The 30 percent tax-rate taxpayer represents the high-tax-rate taxpayer clientele. Recall, the 20 percent tax-rate taxpayer is a marginal investor and is therefore in neither clientele. Taxpayers with tax rates below 20 percent are in the low-tax-rate taxpayer clientele. To demonstrate that this is true, compute the tax, ATCF, and AATROR for the bond investments assuming $t = 10\%$. The answers are as follows: Tax on taxable bond interest = \$5, taxable bond ATCF = \$45; taxable bond AATROR = 4.5% = \$45/\$1,000. The computations for the tax-exempt bond remain constant.

Two important general tendencies are indicated by the above examples. First, taxpayers in a high-tax-rate clientele are best suited to invest in tax-favored investments—investments that have implicit taxes. Second, taxpayers in a low-tax-rate clientele are best suited to invest in fully taxable investments—investments that have no implicit taxes.

Do all high-tax-rate taxpayers invest only in tax-favored investments? No, because nontax considerations dictate otherwise. Nontax costs and benefits are discussed below.

All Nontax Costs and Benefits. The third theme is that all nontax costs and benefits should be analyzed as part of decision making. Recall the ATCF model from Exhibit 1. Nontax costs and nontax benefits are included in BTCF. A broker's fee is an example of a nontax cost. Other examples of nontax costs are listed below. Examples of nontax benefits are (1) sales price received from selling an asset, and (2) income payments received from owning an investment (e.g., the before-tax interest income from a bond).

For example, assume the facts from the bond example examined early in this chapter. Key aspects are in Exhibit 4.

Assume the broker physically holds this bond for the investor and charges a fee of 15 percent of income collected. In this case, the results are shown in Exhibit 5.

Note the BTCF includes two items—the nontax cost of the broker's fee and the nontax benefit of the interest. The broker's 15 percent fee (\$15) reduced the BTCF to \$85 (from \$100), reduced the ATCF to \$51 (from \$60), and reduced the annual after-tax rate of return to 5.1 percent (from 6 percent). The nearly 1 percentage-point reduction in annual after-tax rate of return could have caused the investor to prefer a different investment, perhaps one that returned 5.5 percent after

EXHIBIT 4
Summary of Bond Example

Assumptions

Investment in taxable bonds	$1,000
Annual interest rate	10%
Tax rate	40%

ATCF model based on assumptions

Δ Taxable income (loss)	$100
Δ BTCF (before-tax cash flow)	$100
± Δ Explicit tax	(40)
Δ ATCF (after-tax cash flow)	$60

$$\text{Annual after-tax rate of return} = \frac{\text{ATCH \$60}}{\text{Investment \$1,000}} = 6\%$$

tax. This example illustrates the importance of including nontax costs and benefits in all tax analyses.

Frictions

Nontax costs are also called "frictions." One or more frictions could exist in connection with a currently owned investment, a currently owned business enterprise, a prospective investment, or a prospective business enterprise. Frictions reduce the after-tax profitability of transactions and, if large enough, can result in making an alternative transaction optimal. In other words, frictions may force the decision maker to choose an alternative course of action. The example of the broker's fee, above, illustrates the effect of frictions. Examples of frictions are listed in Exhibit 6.

Restrictions

Aside from frictions, tax law and other legal restrictions may render an alternative infeasible. For example, assume a father purchased stock 8 years ago for $10,000 and today the stock is worth $7,000. The father, who has a 31 percent explicit marginal tax rate, believes the stock's

EXHIBIT 5
Bonds and Nontax Costs

ATCF model

Δ Taxable income (loss)		$85
Δ BTCF (before-tax cash flow):		
Interest income	$100	
less 15% fee (15)	(15)	85
± Δ Explicit tax		34
Δ ATCF (after-tax cash flow)		$51

$$\text{Annual after-tax rate of return} = \frac{\text{ATCH \$51}}{\text{Investment \$1,000}} = 5.1\%$$

EXHIBIT 6
Examples of Frictions

Transaction costs (for buying, selling, or holding)
- Broker[a]
- legal
- management
- negotiation expertise
- tax compliance expertise
- costs of converting from one business form to another (e.g., disruption and other costs from shifting between business forms such as corporation, partnership, sole proprietorship, limited liability company)

Information costs (for buying, selling, or holding)
- outside consultants
- tax-planning expertise
- financial analysis
- risk analysis

Agency costs (for buying, selling, or holding)
- monitoring
- management

[a] Broker costs include processing, administration, and inventory.

value will rise in the future but would like to take advantage of the $3,000 tax loss today ($10,000 − $7,000). The father decides to sell the stock to his daughter for $7,000 expecting to generate a $3,000 tax loss with the family still owning the stock. Under these circumstances, the tax law restricts the father from creating a tax loss. The related-party transaction rules (Internal Revenue Code Section 267) state that losses on sales between certain related parties are not recognized for tax purposes. There are many other restrictions in the tax law, for which discussion and illustration may be found in technical tax texts.

Efficient Tax Planning vs. Tax Minimization

Conventional tax texts often imply that the role of tax planning is to minimize tax liability. This strategy can lead to poor decisions—decisions that do not maximize after-tax profitability. Consider the comparison of taxable corporate bonds and tax-exempt bonds, above. If the objective were to minimize tax liability, all investors would always invest in tax-exempt bonds and never invest in corporate bonds. However, the above analysis demonstrates that taxpayers in low-tax-rate clienteles are better off investing in taxable corporate bonds (and paying some amount of tax) than investing in tax-exempt bonds and paying no tax.

Algebraic Models

The "language" of the microeconomic approach is a set of algebraic formulas for various savings vehicles that can be used to compute after-tax future values, present values, and internal rates of return. Once the intuition behind these savings vehicles is understood, the intuition and the algebra can be applied to increasingly complex decision contexts, such as the entity selection problem discussed below. The starting point, however, is to understand the linkage between after-tax cash flows and the formulas.

Savings Account Formula

The savings account formula is a good place to start because it is a simple and common type of investment. The discussion that follows demonstrates (1) how compounding enables investment dollars to grow, (2) how annual taxation affects earnings, and (3) how after-tax earnings growth is represented in the future value formula. Consider the following assumptions regarding an investment in a savings account:

Investment	$10,000
Interest rate	5%
Holding period	3 years
Investor's tax rate	40%

Further assume that tax on the annual interest earned will be withdrawn from the account and paid to the tax collector at the end of each year.[6] Under these assumptions, the investment performs as shown in the spreadsheet in Exhibit 7.

The spreadsheet analysis in Exhibit 7 relies on the ATCF model, except the model is slightly rearranged. From the investor's point of view, there are only two cash flows: a $10,000 investment outflow made at the end of year 0 (or, alternatively, at the start of year 1), and an inflow from the account balance withdrawn at the end of year 3. The interest earned and the taxes paid during years 1–3 are not cash flows to the investor. Interest accrues within the account and is not paid out to the investor. Taxes are assumed to be paid directly from the account to the tax collector.

Note how interest is earned in the savings account. In year 1, $500 interest is earned on the $10,000 investment at the interest rate of 5 percent. Tax of $200 (40 percent of $500) is paid out of the account, leaving $300 to be added to the $10,000 initial investment.

Based on computations for year 1, the after-tax internal rate of return is 3 percent:

$$\frac{\text{after-tax earnings } \$300}{\text{investment } \$10{,}000} = 3\% \tag{7}$$

The ratio approach shown above is valid for computing the after-tax internal rate of return

[6] To assume all earnings are left in the account and the tax is paid with other funds is the same as assuming the tax is paid from the account and a like amount is immediately deposited in the account. One could account for such additional investments in the savings account, but doing so would make the analysis far more complex and provide few additional insights. In other words, the cost of increased complexity is greater than the educational benefit provided.

EXHIBIT 7
Savings Account Activity

	End of			
	Year 0	**Year 1**	**Year 2**	**Year 3**
Δ After-tax cash flow—Investment	$(10,000)			
Beginning account balance		$10,000	$10,300	$10,609
Taxable income—Interest earned		500	515	530
Explicit tax @ t = 40%		(200)	(206)	(212)
After-tax earnings		300	309	318
Ending account balance		$10,300	$10,609	$10,927
Δ After-tax cash flow—Total withdrawn				$10,927

for a single time period only (e.g., one year). For multiple time period investments (e.g., ten years), other methods must be used.

For example, another way to compute the after-tax internal rate of return for a savings account is to use a slightly modified version of the short-cut ATCF model:

$$\text{BTIRR}(1 - t) = \text{ATIRR}$$
$$.05(1 - .40) = .03 \tag{8}$$

At the start of year 2, the account balance is \$10,300, comprised of the \$10,000 initial investment plus \$300 after-tax earnings from year 1. During year 2, the 5 percent interest rate is applied to the entire \$10,300. Thus, year 2 interest is earned on *both* the \$10,000 initial investment and the \$300 after-tax earnings from year 1. Compounding is taking place because interest is being earned on interest. As in year 1, tax is paid on the interest during the year and the after-tax earnings (\$309) are added to the year 2 beginning balance (\$10,300) to compute the year 3 beginning balance (\$10,609). The after-tax earnings in year 2 (\$309) are \$9 larger than the after-tax earnings in year 1 because the 3 percent after-tax internal rate of return was earned on year 1's \$300 after-tax earnings (3 percent of \$300 is \$9).

Computations in year 3 follow the same pattern as in year 2. After-tax earnings continue to rise in year 3 due to compounding. The balance at the end of year 3 is \$10,927, comprised of the \$10,000 initial investment and \$1,249 after-tax earnings (\$300 + \$309 + \$318).

A future value formula can be used to compute the year 3 balance of \$10,927. The future value formula is as follows:

$$I(1 + R)^n = FV \tag{9}$$

where:

I = initial investment;
R = interest rate (or, more generally, before-tax earnings rate);
n = number of periods; and
FV = future value (before tax);

The year-3 balance can be computed as shown below by substituting the after-tax internal rate of return for the savings account (ATIRR, computed above) as follows:

$$I(1 + \text{ATIRR})^n = FV \tag{10}$$
$$\$10{,}000(1 + .03)^3 = \$10{,}927$$

The term $(1 + .03)^3$ performs compounding each year at the 3 percent after-tax internal rate of return. The complete savings account formula is as follows:

$$I[1 + R(1 - t)]^n = FV$$
$$\$10{,}000[1 + \underline{.05(1 - .40)}]^3 = \$10{,}927 \tag{10}$$
$$\text{or } .03$$

The term R(1 − t) computes the after-tax internal rate of return for the savings account. It is virtually the same as the modified version of the short-cut ATCF model (shown above):

$$\text{BTIRR}(1 - t) = \text{ATIRR} \tag{8}$$
$$.05(1 - .40) = .03$$
$$R(1 - t) = r \tag{11}$$
$$.05(1 - .40) = .03$$

Note that while equation (8) produces the correct r for a savings account, it does not compute the correct r for certain types of investments—generally, investments with tax-favored treatment (such as deductibility of initial investment and/or deferral). Tax-favored investments are discussed below. Three key tax characteristics distinguish various types of investments from each other. The characteristics are as follows: (1) rate of taxation—ordinary, preferential, or exempted; (2) frequency of taxation—annual, deferred, or never; and (3) deductibility of initial investment—deductible or not.

For the savings account, the rate of taxation is ordinary (t = 20 percent). The frequency of taxation is annual, meaning tax is paid annually on the interest earned. In contrast, some investments (e.g., pension funds) allow interest to accumulate tax-free until it is withdrawn at the end of the holding period—tax on the interest is "deferred" to a future year.

While some investments are tax deductible (e.g., certain individual retirement accounts), investments in ordinary savings accounts are not deductible. Thus, such investments are said to be made with after-tax dollars. For instance, to invest $10,000 after-tax dollars in a savings account, the investor first has to earn $16,667 before-tax, assuming a tax rate of 40 percent. Note that $16,667 less 40 percent tax (or $6,667) equals $10,000. Using the short-cut ATCF model:

$$\text{Salary } (1 - t) = \text{After-tax dollars available for investment;}$$

$$\$16{,}667\ (1 - .40) = \$10{,}000.$$

Alternatively, since gifts of money received are not taxable, a gift of $10,000 also provides $10,000 available for after-tax investment.

For the savings account example, the 3 percent after-tax internal rate of return was easily computed. However, for investments that do not have annual taxation and/or that benefit from deductibility of their initial investment, computing the after-tax internal rate of return (r) is not nearly as straightforward.

A general formula is available to compute r for any investment characterized by one initial after-tax investment and one after-tax payout at the end of the holding period. The formula is as follows:

$$(FV/I)^{1/n} - 1 = r \qquad (12)$$

where:

FV = after-tax future value of investment;
I = after-tax investment;
n = holding period; and
r = after-tax internal rate of return.

Here is an example. Assume the following:

FV = $5,000
I = $2,500
n = 20

Under these assumptions, r = .0352649 = 3.5% (approximately).

This example shows that it takes 20 years for an investment in a savings account to double if the after-tax interest rate (i.e., interest rate × (1 − t)]) is slightly over 3.5 percent compounded annually.

Mutual Fund Formula

A mutual fund is operated by an organization that raises capital mainly from a large number of individual investors. It then pools the funds and invests in the stock market. Individual investors invest in mutual funds because they do not have enough capital to invest directly in the stock market and maintain a diversified investment portfolio. When the mutual fund sells stocks (that it purchased more than one year earlier) at a gain, the gain is a long-term capital gain and is taxed at reduced tax rates to the individual investors (rather than to the mutual fund).

More than 7,500 mutual funds are available to investors. Some offer only interest income, or only dividends, or only capital gain income. Others offer a combination. Some mutual funds invest in particular industries or groups of industries and others offer a diversified investment in an entire market. Risk levels also vary among mutual funds.

For modeling purposes, assume a mutual fund produces only long-term capital gain income and the risk level is the same as a savings account. It differs from a savings account in only one respect—its earnings are taxed as long-term capital gains rather than ordinary income. The capital gain taxes are paid to the tax collector and the after-tax profits (gains) are reinvested in the stock market by the mutual fund. This course of events is identical to savings account activity, except mutual funds generate capital gain income taxed at the capital gain tax rate (g), whereas savings accounts generate interest income taxed at the ordinary tax rate (t). These assumptions enable the study of just one effect—capital gains taxation vs. ordinary income taxation.

The future value formula for the mutual fund is as follows:

$$I[1 + R(1 - g)]^n = FV \tag{13}$$

where:

- I = initial investment made with after-tax dollars;
- R = before-tax internal rate of return;
- FV = future value of after-tax cash flow (ATCF);
- t = tax rate on ordinary income;
- g = tax rate on capital gains ($g = .20$ when $t \geq .15$; $g = .10$ when $t = .15$); and
- n = number of periods.

What is the difference between the savings account and mutual fund formulas? The only difference is the tax rate. Savings account earnings are taxed at t, while mutual fund earnings are taxed at g.

The mutual fund has the following three tax characteristics: (1) rate of taxation—preferential capital gains; (2) frequency of taxation—annual; and (3) deductibility of initial investment—not deductible since the investment is made with after-tax dollars.

Below is an illustration of the mutual fund using the spreadsheet approach. Assume the following investment characteristics:

I (after-tax investment)	$10,000
R (earnings rate)	5%
n (holding period)	3 years
t (investor's tax rate on ordinary income)	40%
g (investor's tax rate on capital gains)	20%

As with the savings account example above, assume that tax is withdrawn from the fund and paid to the tax collector at the end of each year. Under these assumptions, the investment performs as shown in Exhibit 8.

Compare the mutual fund spreadsheet with the savings account spreadsheet. The mutual fund tax rate (g = 20%) produces lower taxes and larger after-tax earnings than the savings account tax rate (t = 40%). The mutual fund's lower tax rate results in a larger future value of $11,249 as compared to $10,927 for the savings account.

Using equation (13), the future value could be computed directly, as follows:

$$I[1 + R(1 - g)]^n = FV$$

$$\$10{,}000[1 + .05(1 - .20)]^3 = \$11{,}249 \tag{13}$$

The after-tax internal rate of return of the mutual fund is 4 percent, or .05(1 − .20). This computation is based on the formula shown earlier, BTIRR (1 − t) = ATIRR. For the mutual

EXHIBIT 8
Mutual Fund Activity

	End of			
	Year 0	**Year 1**	**Year 2**	**Year 3**
Δ After-tax cash flow—Investment	$(10,000)			
Beginning account balance		$10,000	$10,400	$10,816
Taxable income—Interest earned		500	520	541
Explicit tax @ g = 20%		(100)	(104)	(108)
After-tax earnings		400	416	433
Ending account balance		$10,400	$10,816	$11,249
After-tax cash flow—Total withdrawn				$11,249

fund, variable g replaces variable t in the formula. As expected, the mutual fund's 4 percent ATIRR exceeds the savings account's 3 percent ATIRR.

To summarize, the savings account is the same as the mutual fund in two ways. First, the frequency of taxation is annual. Second, the initial investment is not deductible. The investment is made with after-tax dollars. Thus, ATIRR = BTIRR (1 − tax rate).

The savings account differs from the mutual fund solely due to the rate of taxation. For the taxpayer in this example, there is a 20 percent capital gains tax rate for the mutual fund vs. a 40 percent tax rate for the savings account.

Single Premium Deferred Annuity Formula

Single premium deferred annuity (SPDA) accounts are offered by insurance companies. The investor deposits cash with an insurance company that then invests the cash in corporate bonds and/or other interest-bearing investments. The investor's deposit is made with after-tax dollars (just like deposits into savings accounts and mutual funds), yet interest in the SPDA account compounds and accumulates tax free until it is withdrawn at the end of a prescribed holding period. Withdrawals made before the investor reaches age 59.5 result in a 10 percent penalty tax in addition to explicit tax on the accumulated interest.

Tax-free compounding and accumulation of interest is the key advantage of the SPDA. "Deferral" is the preferential tax treatment that provides SPDAs their advantage. Deferral means that income (SPDA interest) earned during the year does not become taxable until some future year (the year of withdrawal from the SPDA account). Thus, interest is earned at the before-tax interest rate (R) and is also compounded at R. Compare SPDA compounding with savings account compounding at the after-tax rate r: $R(1 - t) = r$.

To summarize, the SPDA has the following three tax characteristics: (1) rate of taxation—ordinary; (2) frequency of taxation—deferred; and (3) deductibility of initial investment—not deductible since the investment is made with after-tax dollars.

The SPDA future-value formula is more complex than the savings account and mutual fund formulas. To understand the SPDA formula, it may be best to "build it" in steps.

Step 1: Original after-tax investment plus all interest earned tax free is the future value of the SPDA account just before taxes are paid	−	Tax on all interest	=	Future value of after-tax cash flow from SPDA.

Step 2: $I(1 + R)^n$ − Tax on all interest = FV of SPDA.

Note that $I(1 + R)^n$ equals the original after-tax investment plus all interest that has compounded and accumulated tax free. View this equation as being the same as the savings account equation (10) but in which t = 0. Equation (10) is below:

$$I[1 + R(1 - t)]^n = FV \tag{10}$$

If t = 0, then equation (10) becomes:

$$I[1 + R]^n = FV.$$

Step 3: $I(1 + R)^n$ − tax on all interest = FV of SPDA;

$$I(1 + R)^n - t[\underline{I\,(1 + R)^n - I}] = \text{FV of SPDA.} \tag{14}$$

The underlined portion of the second term, $[I\,(1 + R)^n - I]$, is interest that has compounded and accumulated tax free. This term does not include the original after-tax investment (I) because return of the original after-tax investment is not taxable. Only the return earned on the original after-tax investment is taxable. By subtracting (−I), all that remains is the untaxed interest. The untaxed interest is then taxed at tax rate t: $t\,[I\,(1 + R)^n - I]$.

Step 4: $I(1 + R)^n - t[I(1 + R)^n - I]$ = FV of SPDA. (14)

$$I[(1 + R)^n - t\,[(1 + R)^n - 1]] = \text{FV of SPDA.} \tag{15}$$

This step factors out the after-tax investment (I) and multiplies −t by the two terms within the brackets: $(1 + R)^n$ and −1.

Step 5: $I[(1 + R)^n - t[(1 + R)^n - 1]]$ = FV of SPDA. (15)

$$I[(1 + R)^n - t(1 + R)^n + t] = \text{FV of SPDA.} \tag{16}$$

Partitioning equation (16) into its components shows the following:

$$I[\underbrace{\underline{(1 + R)^n}}_{(a)} - \underbrace{\underline{t(1 + R)^n}}_{(b)} + \underbrace{\underline{t}}_{(c)}] = \text{FV of SPDA} \tag{16}$$

Part (a) represents the original after-tax investment plus all interest earned tax free—it is the future value of the SPDA just before taxes are paid. In part (b), the entire balance in the SPDA account (principal plus interest) is taxed at tax rate t. The purpose of part (c) is to add back (adjust for) the tax on the principal in part (b).

Step 6: $I[\underline{(1 + R)^n - t(1 + R)^n} + t]$ = FV of SPDA. (16)

Factoring out the term $(1 + R)^n$ from the underlined portion of equation (16) leaves the following for the underlined portion of the formula:

$$\underline{(1 + R)^n(1 - t)}$$

Including the underlined portion in equation (16) provides the final version of the formula:

$$\underbrace{I[\overbrace{(1 + R)^n}^{(a)}(1 - t)}_{(b)} + \underbrace{\underline{t}}_{(c)}] = \text{FV of SPDA} \tag{17}$$

Part (a) is the original after-tax investment plus all interest earned tax free. It represents the future value of the SPDA just before taxes are paid (i.e., the before-tax future value). Earnings grow at the before-tax rate of return (rather than the after-tax rate of return, as with the savings account and the mutual fund). In part (b), the entire balance in the SPDA account (principal plus interest) is taxed at tax rate t. Note the following occurring in part (b):

$$I \times (1 + R)^n \times (1 - t) = I(1 + R)^n - [t \times I(1 + R)^n]$$

The purpose of part (c) is to add back (adjust for) the tax on the principal.

Exhibit 9 shows a spreadsheet example of the SPDA, assuming the following investment characteristics:

I (after-tax investment)	$10,000
R (interest rate)	5%
n (holding period)	3 years
t (investor's tax rate)	40%

Exhibit 9 further assumes that tax is withdrawn from the fund and paid to the tax collector at the end of the three-year holding period. Under these assumptions, the investment performs as shown. Using equation (17), the future value could be computed directly, as follows:

$$I[(1 + R)^n(1 - t) + t] = \text{FV of SPDA}; \quad (17)$$

$$\$10{,}000[(1 + .05)^3(1 - .40) + .40] = \$10{,}946.$$

The after-tax internal rate of return is 3.06 percent, computed as follows:

$$(FV/I)^{1/n} - 1 = r \quad (12)$$

where:

FV = after-tax future value of the investment;
I = after-tax investment;
n = holding period; and
r = after-tax internal rate of return.

For the SPDA, the ATIRR equation is as follows:

$$(FV/I)^{1/n} - 1 = r;$$

$$(\$10{,}946/\$10{,}000)^{1/3} - 1 = .0305882 = 3.06\% \text{ (approximately)}. \quad (12)$$

Comparing Three Savings Vehicles

Exhibit 10 lists the characteristics and future value formulas of the three savings vehicles discussed thus far. Exhibit 11 compares the future values and after-tax internal rates of returns

EXHIBIT 9
SPDA Activity

		End of		
	Year 0	**Year 1**	**Year 2**	**Year 3**
Δ After-tax cash flow—Investment	$(10,000)			
Beginning account balance		$10,000	$10,500	$11,025
Interest earned (total = $1,576)		500	525	551
Less tax increase on total interest: 40% × 1,576 at end of Year 3				(631)
Ending account balance		$10,500	$11,025	$10,946
Δ After-tax cash flow— Total withdrawn				$10,946

EXHIBIT 10
Comparison of Three Savings Vehicles

Savings Vehicle	Rate of Taxation	Frequency of Taxation	Initial Investment Deductible?	Future Value (FV) of After-Tax Cash Flow Formula
Savings Account	Ordinary	Annual	No	$I[1 + R(1 - t_o)]^n = FV$ (10)
Mutual Fund	Preferential	Annual	No	$I[1 + R(1 - g)]^n = FV$ (13)
Single Premium Deferred Annuity	Ordinary	Deferred	No	$I[(1 + R)^n(1 - t_n) + t_n] = FV$ (17)

where:

I = after-tax dollars invested;
R = before-tax rate of return (i.e., interest rate);
FV = future value of after-tax cash flows;
n = holding period (years);
t_o = ordinary tax rate during holding period;
t_n = ordinary tax rate at end of holding period; and
g = capital gains tax rate.

(ATIRRs) for the savings account, mutual fund, and SPDA under various holding periods. An after-tax investment of $1 (rather than $10,000) makes it easier to compare future values over long holding periods.

Notice the ATIRRs for the three-year holding period are the same as those calculated above. The future values for the three-year holding period are also consistent with those computed earlier.

EXHIBIT 11
Future Values and Rates of Return for Three Savings Vehicles

Assumptions						
After-tax Investment (I)	$1					
Interest rate (R)	5%					
Ordinary income tax rate (t)	40%					
Capital gains tax rate (g)						
Holding period > 12 months	20%					
Analysis						
Holding Period (n)	**1**	**3**	**10**	**20**	**40**	**100**
	Future Value of After-Tax Cash Flows ($)					
Vehicle						
Savings account	1.03	1.09	1.34	1.81	3.26	19.22
Mutual fund	1.04	1.12	1.48	2.19	4.80	50.50
SPDA	1.03	1.09	1.38	1.99	4.62	79.30
	After-Tax Internal Rates of Return (%)					
Savings account	3.00	3.00	3.00	3.00	3.00	3.00
Mutual fund	3.60	4.00	4.00	4.00	4.00	4.00
SPDA	3.00	3.06	3.25	3.51	3.90	4.47

The savings vehicles can be compared using future values or ATIRRs. The ATIRRs, however, clearly show that the ATIRRs for the savings account and mutual fund remain constant regardless of the holding period. The reason is that tax is paid each period (year) on the income earned. Interest is compounded at the after-tax rate of return [R(1 − t)] or [R(1 − g)]. In contrast, interest is compounded at the before-tax rate of return for the SPDA, which enables deferral. The value of the deferral increases with the holding period. That is why the ATIRRs for the SPDA increase as the holding period increases. For example, at a 10 percent interest rate it takes only 25 years for the SPDA to outperform the mutual fund. That is also why SPDAs are more attractive for long-term retirement savings than savings accounts or mutual funds.

Pension Funds

Several types of pension funds exist. The two most publicized for individuals are the deductible Individual Retirement Account (IRA) and the Roth IRA. Other pension-type accounts include educational IRAs, Keogh Plans for self-employed taxpayers, and a variety of corporate pension funds. As with SPDAs, earnings in pension funds compound and accumulate tax free until they are withdrawn. At withdrawal, the funds may or may not be taxable depending on the type of pension account. Thus, pension fund investors benefit from either deferral or tax exemption. In addition, deposits (contributions) into pension funds may be tax deductible (e.g., deductible IRA contributions) or excludable (e.g., corporate pension contributions). The benefits of deductibility/excludability, deferral, and tax exemption distinguish pension funds from all other savings vehicles. Amounts that are deductible or excludable are not included in taxable income and, therefore, are not taxed in the current year. As with SPDAs, nonqualified withdrawals result in a 10 percent penalty tax in addition to tax at the explicit marginal tax rate on part or all of the withdrawal.

Roth IRAs differ from deductible IRAs in a number of ways. Contributions to Roth IRAs are not deductible and qualified withdrawals are not taxable. Thus, Roth IRAs are tax-exempt accounts. Since contributions to Roth IRAs are not deductible, these contributions are made with after-tax dollars. The annual limitation on contributions to Roth accounts is $2,000. In contrast, contributions made to deductible IRAs are made with before-tax dollars because they are deductible. The before-tax dollar investment limit is $2,000. All qualified withdrawals from deductible IRAs are taxable at the taxpayer's explicit marginal tax rate on ordinary income at the time of withdrawal.

The savings vehicle formulas discussed earlier (savings account, mutual fund, SPDA) facilitate comparisons across saving vehicles by specifying equal after-tax investments regardless of whether the before-tax costs are equal. For example, a $1,600 after-tax (i.e., nondeductible) investment in a savings account can be compared with a $1,600 after-tax investment in a mutual fund and/or SPDA. These investments can also be directly compared to a $1,600 investment in a Roth IRA, since the investment is made with after-tax (nondeductible) dollars. When comparing these investments with a deductible IRA, however, the deposit in the deductible IRA would be a $2,000 before-tax (i.e., deductible) deposit, assuming the taxpayer is in the 20 percent tax bracket. All of these savings vehicles are directly comparable because the after-tax investments are equal—the after-tax investment in the deductible IRA is $1,600 [$2,000 × (1 − .20)]. It would not be appropriate to compare a $2,000 (after-tax) Roth IRA contribution with a $2,000 deductible (before-tax) IRA contribution because the after-tax costs of these investments are not equal.

How can the framework's savings vehicles facilitate a Roth vs. deductible IRA analysis in light of tax-law restrictions on investment size? Consider viewing the savings vehicles as investment components rather than complete investments. If an investor with a tax rate of 20 percent wants to invest $2,000 after tax while maximizing the amount invested in a deductible IRA, then a $2,000 complete after-tax investment must be spread over two or more investment components. The first investment component would include $1,600 after-tax dollars (resulting from $2,000 before-tax dollars) invested in a deductible IRA. The second investment component would include $400 after-tax dollars invested in some other investment vehicle such as a savings account, mutual fund, or SPDA.[7]

The future-value formula for the Roth IRA and educational IRA is as follows:

$$I(1 + R)^n = FV \tag{18}$$

where:

I = initial investment made in after-tax dollars;
R = before-tax internal rate of return;
FV = future value of ATCF (as well as future value of BTCF); and
n = number of periods.

Equation (18) is a tax-exempt account. For Roth IRAs, I is limited to $2,000 per year. For educational IRAs, I is limited to $500 per child. Thus, a father and a mother with two children can each contribute $250 annually to educational IRA accounts for each child—a total of $500 deposited in each child's account each year.

The future value formula for a deductible pension fund is as follows:

$$\frac{I}{(1 - t_o)}(1 + R)^n(1 - t_n) = FV \tag{19}$$

or, equivalently:

$$I\left[\frac{1}{(1 - t_o)}(1 + R)^n(1 - t_n)\right] = FV \tag{20}$$

where:

I = initial investment made in after-tax dollars;
R = before-tax internal rate of return;
FV = future value of ATCF;
t_o = tax rate during the holding period;
t_n = tax rate at end of holding period; and
n = number of periods.

Two aspects of the pension equation differ from the previous equations. First, the initial after-tax investment (I) is "grossed up" (multiplied) by the ratio $1/(1 - t_o)$. Consider an investor who earns $2,000 in salary. At a tax rate of 20 percent, $400 tax is paid to the tax collector, leaving $1,600 after-tax dollars to invest in a savings account. However, if the taxpayer chooses to make a deposit into a deductible IRA, she can deposit her $1,600 of after-tax dollars plus the $400 that otherwise would have been paid to the tax collector. The $2,000 total before-tax investment grows at a before-tax rate of return (R). At withdrawal, tax is paid on the entire account because none of the money in the account has been subjected to tax.

Second, there are two tax-rate terms, t_o and t_n. The reason for two tax rates is to capture the effect of rising or falling tax rates during the holding period. The tax rate at the beginning of the holding period and throughout the holding period except for the last year is t_o. The tax rate in the last year of the holding period is t_n. For example, a typical scenario for individuals is to have a higher explicit marginal tax rate during their working years when they are earning a salary, and

[7] The rest of this section of the chapter is adapted from an article by Seida and Stern (1998). This article contains additional discussion of comparisons between Roth and deductible IRAs.

a lower explicit marginal tax rate during their retirement years. The variables t_o and t_n enable modeling of falling (rising or constant) explicit marginal tax rates.

Recall the 10 percent penalty for early withdrawals discussed earlier. If applicable, this penalty is easily incorporated into analyses by increasing t_n by 10 percentage points.

The gross-up ratio in equation (20) ensures that the amount earning a return at R is stated in before-tax dollars, as follows:

$$\underline{I\left[\frac{1}{(1 - t_o)}\right.}\left.(1 + R)^n(1 - t_n)\right] = FV \qquad (20)$$

Consider the underlined portion of the equation:

$$I\left[\frac{1}{(1 - t_o)}\right] \qquad (21)$$

Returning to the facts of the investor discussed above, this portion of the equation becomes:

$$\$1,600\left[\frac{1}{(1 - .20)}\right] = \$1,600(1/.8) = \$1,600(1.25) = \$2,000$$

Thus, $\$2,000(1 + R)^n(1 - t_n)$ = FV of the pension fund. The \$2,000 grows at the before-tax rate of return and in year n, the entire balance in the account is taxed at t_n (the investor's tax rate at the time of withdrawal). To summarize, the deductible pension fund has the following three tax characteristics: (1) taxation at the ordinary tax rate; (2) deferred taxation; and (3) deductible initial investment.

Component Approach for Comparing IRAs

A "component" perspective is useful when comparing Roth and deductible IRAs. Recall, the future value of a Roth IRA is as follows:

$$\text{Future value of Roth IRA} = I(1 + R)^n \qquad (18)$$

where:

I = initial (total) investment made in after-tax dollars;
R = before-tax internal rate of return; and
n = number of periods.

From a component perspective, a deductible IRA investment strategy can be characterized as follows:

$$\text{Future value of deductible IRA strategy} = \frac{I_{IRA}}{(1 - t_o)}(1 + R)^n(1 - t_n) + I_{OTHER}[(1 + R)^n(1 - t_n) + t_n] \qquad (22)$$

where:

I_{IRA} = after-tax investment in a deductible IRA (it equals the lesser of (a) \$2,000 × $(1 - t_o)$ or (b) I.);
I = total after-tax investment;
I_{OTHER} = additional after-tax investment made to a non-IRA investment that enables the total after-tax investment in a deductible IRA and the supplemental investment account to equal the after-tax investment in a Roth IRA ($I_{OTHER} = I - I_{IRA}$);
R = before-tax internal rate of return (assumed to be constant across investment alternatives);
t_o = tax rate at the time of contribution and during the holding period;
t_n = tax rate at end of holding period; and
n = number of periods.

Equation (22), the deductible IRA strategy, has two distinct components designated as (a) and (b), below:

$$\underbrace{\frac{I_{IRA}}{(1 - t_o)}(1 + R)^n(1 - t_n)}_{(a)} + \underbrace{I_{OTHER}[(1 + R)^n(1 - t_n) + t_n}_{(b)}. \tag{22}$$

Component (a) is virtually the same as the deductible IRA, as discussed earlier. The only difference is the definition of "after-tax investment" in some cases. Tax-law restrictions that limit the annual deductible IRA investment are explicitly incorporated into equation (22) via the definition of the IRA's after-tax investment (I_{IRA}). The maximum after-tax investment into a deductible IRA is the statutory before-tax investment limit ($2,000) times $(1 - t_o)$, i.e., $1,700 when $t_o = .15$.[8] This maximum amount is referred to as the deductible IRA's after-tax investment limit.

Component (b) models the after-tax investment that exceeds the deductible IRA's after-tax investment limit (denoted I_{OTHER}). Thus, only when the after-tax investment amount being evaluated is greater than the deductible IRA's after-tax investment limit does this second component become necessary. Component (b) in equation (22) is an SPDA. However, the SPDA could be replaced by other investment vehicles, such as a savings account or a mutual fund. The two components of equation (22) are necessary to compare a $2,000 after-tax Roth IRA investment with an investment strategy that includes a deductible IRA.

The spreadsheet approach is used to illustrate a deductible Keogh (self-employed) pension fund. Recall, the previous spreadsheet examples assumed an after-tax investment of $10,000. To be comparable, assume the same here. However, note that the $10,000 after-tax amount is grossed up by the equation to its before-tax equivalent. Assume the following:

I (after-tax investment)	$10,000
R (interest rate)	5%
n (holding period)	3 years
t_0 (investor's tax rate during holding period)	40%
t_n (investor's tax rate at end of holding period)	40%

Under these assumptions, the investment performs as shown in Exhibit 12.

[8] Equation (22) can be made more general (i.e., apply to other deductible pension investments) by simply changing the definition of I_{IRA} so that it models any dollar-based investment limit. This can be accomplished by replacing the $2,000 with a variable that represents any dollar-based limit (e.g., LIMIT). Thus, the after-tax investment in the pension account is the lower of (a) LIMIT × $(1 - t_o)$, or (b) I.

EXHIBIT 12
Example of Deductible Pension Investment

	End of			
	Year 0	**Year 1**	**Year 2**	**Year 3**
Δ After-tax cash flow—Investment	$(10,000)			
Contribution by tax collector at t_0	(6,667)			
Beginning account balance		$16,667	$17,500	$18,375
Interest earned		833	875	919
Ending account balance—Before tax		$17,500	$18,375	$19,294
Explicit tax at t_n on account balance at withdrawal				(7,718)
Δ After-tax cash flow—Withdrawal				$11,576

If the after-tax investment (I) is $10,000, then where does the extra $6,667 come from? As explained above, if the taxpayer is willing to invest $10,000 of after-tax earnings in a pension account, then the government is willing to allow the taxpayer to deduct and deposit the before-tax equivalent. Thus, at a 40 percent marginal tax rate, the deduction (and contribution to a pension fund) is $16,667. In other words, the taxpayer writes a check for $16,667, deposits $16,667 in the pension account, and deducts $16,667 on the tax return. The deduction decreases the tax liability by $6,667 ($16,667 × .40). The after-tax pension investment is $10,000, but the before-tax amount invested is $16,667. It is a before-tax amount because it is deductible. Algebraically, the $16,667 is computed as follows:

Using equation (21), the total amount being deposited in the pension account is calculated as follows:

$$I\left[\frac{1}{(1 - t_o)}\right] \qquad (21)$$

$$\$10{,}000\left[\frac{1}{(1 - .40)}\right] = \$16{,}667.$$

Thus, a deduction of $16,667 at a 40 percent tax rate provides a tax savings of $6,667. The deposit of $16,667 in the pension account is best viewed as an after-tax contribution of $10,000 by the investor plus $6,667 contribution by the tax collector.

Using equation (20), the future value could be computed directly as follows:

$$I\left[\frac{1}{(1 - t_o)}(1 + R)^n(1 - t_n)\right] = FV. \qquad (20)$$

$$\$10{,}000\left[\frac{1}{(1 - .40)}(1 + .05)^3(1 - .40)\right] = \$11{,}576.$$

The after-tax internal rate of return is 5 percent, computed as follows:

$$(FV/I)^{1/n} - 1 = r \qquad (12)$$

where:

FV = after-tax future value of the investment;
I = after-tax investment;
n = holding period; and
r = after-tax internal rate of return.

For the pension fund, the ATIRR equation is as follows:

$$(FV/I)^{1/n} - 1 = r$$

$$(\$11{,}576/\$10{,}000)^{1/3} - 1 = .05 = 5.0\%. \qquad (12)$$

Note that 5 percent = ATIRR = R, the before-tax rate of return (interest rate). Why? Review equation (20) with the values filled in. Note how the 1/(1 − .40) and (1 − .40) terms cancel each other. Using inductive logic, one can conclude that with a constant explicit marginal tax rate (here, 40 percent) R will always equal r for pensions.

Three tax-rate relationships determine the relationship between R and r for the deductible pension. When tax rates are constant ($t_o = t_n$), then R = r and change in the holding period (n) produces no change in r. In this case, the deductible pension provides a tax-free after-tax internal rate of return (r) regardless of the holding period (n). When tax rates are declining ($t_o > t_n$), then r > R and a rising holding period (n) causes r to decline but not < R. Here, the deductible pension provides an after-tax internal rate of return (r) that is actually larger than the before-tax rate of return (R). When tax rates are rising ($t_o < t_n$), then R > r and rising n causes r to rise but not > R. The deductible pension provides an after-tax internal rate of return (r) that is lower than the before-tax rate of return (R). When tax rates are rising, the deductible pension account may be the worst of all investments. In fact, it can produce a negative after-tax return.

Note that the three tax-rate trends (constant, declining, rising) represent three different tax clienteles. The tax clientele with rising tax rates would choose a Roth IRA ($r = R$) over a deductible IRA ($r < R$). Yet, the tax clientele with declining tax rates may be better off with a deductible IRA ($r > R$).

Comparing Savings Vehicles

Exhibit 13 lists the characteristics and future value formulas of the savings vehicles discussed thus far. Exhibit 14 compares the future values and after-tax internal rates of returns (ATIRRs) for all five savings vehicles. It is the same as Exhibit 11, except the deductible pension fund and tax-exempt accounts are shown along with the savings account, mutual fund, and SPDA.

Notice how the deductible pension fund and tax-exempt accounts dominate all of the other savings vehicles. The combined benefit of deferral and deductibility of initial investment gives the deductible pension fund tremendous after-tax earning power. When tax rates are expected to remain constant, the deductible pension fund is equivalent to a tax-exempt account.

APPLICATIONS OF THE MICROECONOMIC APPROACH

The microeconomic approach can be applied to many types of investment and business decisions—from straightforward transactions such as choosing between investment in taxable corporate bonds or tax-free tax-exempt bond bonds to complex scenarios such as entity selection, compensation planning, international business, and mergers and acquisitions. These are briefly summarized below.

EXHIBIT 13
Comparison of Five Savings Vehicles

Savings Vehicle	Rate of Taxation	Frequency of Taxation	Initial Investment Deductible?	Future Value (FV) of After-Tax Cash Flow Formula	
Savings Account	Ordinary	Annual	No	$I[1 + R(1 - t_o)]^n = FV$	(10)
Mutual Fund	Preferential	Annual	No	$I[1 + R(1 - g)]^n = FV$	(13)
Single Premium Deferred Annuity	Ordinary	Deferred	No	$I[(1 + R)^n(1 - t_n) + t_n] = FV$	(17)
Deductible Pension	Ordinary	Deferred	Yes	$\frac{I}{(1 - t_o)}(1 + R)^n(1 - t_n) = FV$	(19)
Tax-Exempt Account	None	NA	No	$I[1 + R]^n = FV$	(18)

where:
I = after-tax dollars invested;
R = before-tax rate of return (i.e., interest rate);
FV = future value of after-tax cash flows;
n = holding period (years);
t_o = ordinary tax rate during holding period;
t_n = ordinary tax rate at end of holding period; and
g = capital gains tax rate.

EXHIBIT 14
Future Values and Rates of Return for Five Savings Vehicles

Assumptions

After-tax investment (I)	$1
Interest rate (R)	5%
Tax rate (t): $t = t_0 = t_n$	40%
Capital gains tax rate (g)	20%

Analysis						
Holding Period (n)	**1**	**3**	**10**	**20**	**40**	**100**
Vehicle			**Future Value of After-Tax Cash Flows ($)**			
Savings account	1.03	1.09	1.34	1.81	3.26	19.22
Mutual fund	1.04	1.13	1.48	2.19	4.80	50.50
SPDA	1.03	1.09	1.38	1.99	4.62	79.30
Deductible pension	1.05	1.16	1.63	2.65	7.04	131.50
Tax-exempt account	1.05	1.16	1.63	2.65	7.04	131.50
			After-Tax Internal Rates of Return (%)			
Savings account	3.00	3.00	3.00	3.00	3.00	3.00
Mutual fund	4.00	4.00	4.00	4.00	4.00	4.00
SPDA	3.00	3.06	3.25	3.51	3.90	4.47
Deductible pension	5.00	5.00	5.00	5.00	5.00	5.00
Tax-exempt account	5.00	5.00	5.00	5.00	5.00	5.00

Entity Selection

The savings vehicle equations can be adapted to compare the impact of corporate double taxation on after-tax profitability with that of single taxation available with flow-through entities (e.g., partnerships, limited liability entities taxed as partnerships, S corporations, and sole proprietorships). The savings account equation illustrated above is used as a simplified representation of the entire set of flow-through entities. This is because the savings account tax characteristics match those of flow-throughs—annual taxation of all realized income at the ordinary marginal tax rate and nondeductibility of the initial investment.

In contrast, investments in corporations subject to double taxation can be modeled using a combination of the savings account formula and the SPDA formula, as follows:

$$I([1 + R_c(1 - t_c)]^n(1 - g) + g) = FV_{cp} \qquad (25)$$

where:

I = initial investment in after-tax dollars made by the shareholders;
R_c = before-tax internal rate of return earned by the corporation entity;
FV_{cp} = shareholder's personal future value of after-tax cash flows;
t_c = corporate tax rate;
g = capital gains tax rate; and
n = number of periods.

The corporate equation reflects annual taxation at the corporate tax rate and assumes the shareholder-level capital gains tax is deferred until the shares are sold. Teaching this perspective could serve as part of the introduction to a unit on entity selection for undergraduates or graduate students.

The Harvard Business School case, *Parker-Spencer: The Legal Form of Joint Ventures* (Wilson 1992d), is written for graduate students. The primary objectives of the case are to help participants identify and analyze tax and nontax factors that affect the legal form of joint ventures. The case compares the partnership form with the corporate form as two corporations assess joint manufacturing and marketing of a herbicide for corn. Students work with after-tax cash flow projections as well as issues that are difficult to quantify, such as various types of risks. Students observe how underlying business assumptions interact with corporate and partnership tax rules to affect cash flows. In addition to the case, Professor Wilson has developed *Parker-Spencer Case Questions* (1992b), *Parker-Spencer Take Aways* (1992c) plus two background readings on joint ventures—all of which can be obtained directly from him. The background readings are titled, *Tax Issues Related to Joint Ventures* (Wilson 1992e) and *Legal Structures and Management Reporting Structures* (Wilson 1992a). The case plus the other materials can comprise two class sessions—one class session for the background readings (if similar material has not already been covered in the course) and one for the case and case questions.

Compensation Planning

Several aspects of compensation planning can be analyzed using the microeconomic approach. Examples include qualified vs. nonqualified stock options, current salary vs. deferred compensation vs. pension, and reimbursement of employee business expenses directly or indirectly via a compensation bonus. In each of these examples, the employee's and employer's current and future marginal tax rates as well as their after-tax earning rates are included in the analyses. This reflects the "all parties" theme discussed earlier. The detailed rules of compensation arrangement could be taught in the context of the microeconomic approach.

International Business

Whether an entire course is being taught on international taxation or just one class session, the microeconomic approach has much to offer. Consistent with the themes discussed above, the parties include domestic and foreign parent corporations, subsidiaries, and taxing authorities. Particularly important are the relative explicit tax rates across jurisdictions. Issues to be considered include initial investment as well as reinvestment of earnings domestically vs. across borders. Technical tax-law issues can be taught in the context of the microeconomic approach for such topics as transfer pricing and expiring foreign tax credits. Nontax aspects can also be considered, including workforce capabilities, raw materials acquisition, and infrastructure issues.

A Harvard Business School case in this area is *Whelan Pharmaceuticals* by Wilson and Katz (1992). It considers whether a pharmaceutical production and distribution facility should be located in Puerto Rico, Ireland, Continental Europe, or the U.S. in Maryland. The firm must identify and make trade-offs between tax, marketing, and manufacturing factors. The case is nonquantitative in nature. A teaching note accompanies the case and includes a helpful "board plan" for classroom discussion.

Mergers and Acquisitions

The second edition of the Scholes et al. (2001) text has four completely revised chapters on mergers and acquisitions (M&A) written by Merle Erickson. The chapters include current research findings pertaining to M&A activity. For example, one of the chapters contains a portion of his working paper with Wang (Erickson and Wang 2000). The paper analyzes the size of premiums paid by corporations to secure a Section 338(h)(10) election in connection with the purchase of a subsidiary.

Merle Erickson has also written two unpublished cases in the M&A area, which he distributes. Both have been presented at academic meetings. *Evaluating the WorldCom/MCI Merger* (Erickson 2000a) focuses on comparing merger structures, tax characteristics of the merging companies and their shareholders, and asset bases. *Analysis of the Tax and Financial Accounting Consequences of Quaker Oates' Sale of Snapple to Triarc* (Erickson 2000b) analyzes asset and stock sales, and contrasts purchase vs. pooling accounting. Various tax and financial accounting implications are examined.

SELECTED TEACHING ISSUES

The microeconomic approach can be taught at both the graduate and undergraduate levels. While the Scholes and Wolfson (1992) and Scholes et al. (2001) editions are intended for graduate students, texts developed by Jones (2000) and Stern and Seida (2000) have been successfully used with undergraduates.

Cases (referenced above and below) are excellent vehicles for graduate students while computer exercises and in-class active learning exercises enhance both undergraduate and graduate learning. *TaxTools* is an interactive web-based workbook available at no charge on my web site (http://www.indiana.edu/~stern). It contains matching, multiple choice, and short-answer questions, many of which are associated with downloadable Excel spreadsheets that enable students to become familiar with concepts, calculations, and tax-planning scenarios. Students receive immediate feedback and direction. Users need only have basic introductory knowledge of the Web, Windows, and Excel to use *TaxTools*. However, users need to have read material corresponding to the exercises in one of the textbooks cited above.

It is widely accepted that students tend to learn best when they are active in the learning process. The text by Stern and Seida (2000) contains a number of short and long in-class active learning exercises. Chapter 1 of the text, along with its active learning exercises, is available for free download from my web site.

ADDITIONAL TEACHING MATERIALS

In addition to the materials cited above, a number of tax faculty have created innovative and useful teaching materials based on the microeconomic approach. Since some materials are not widely marketed and new materials continue to be developed, it is not possible to provide an exhaustive listing. However, the following list identifies several useful works.

Anderson, K. 2000. Taxes and investment planning. In *Federal Taxation: Individuals*, edited by T. Pope, K. Anderson, and J. Kramer. Englewood Cliffs, NJ: Prentice Hall.

The chapter covers investment models and related applications, implicit taxes, and tax clienteles.

Engel, E., M. Erickson, and E. Maydew. 1999. Debt-equity hybrid securities. *Journal of Accounting Research* 37 (Fall): 249–274.

The article discusses and illustrates how trust preferred stock provides preferred stock treatment for financial accounting purposes and debt treatment (with deductible interest payments) for tax purposes.

Erickson, M., and S. Wang. 1999. Exploiting and sharing tax benefits: Seagram and DuPont. *The Journal of the American Taxation Association* 21 (Fall): 35–54.

The article examines how the Section 302(b) stock redemption rules and related exceptions were used to redeem 156 million shares of DuPont for maximum tax advantage—saving over $1 billion shared by the two companies. Additional in-class materials for this case are available directly from Professor Erickson.

Jones, S. M. 2000. *Principles of Taxation for Business and Investment Planning*. New York, NY: Irwin McGraw-Hill.

This text applies various aspects of the microeconomic approach to the role taxes play in business and investment decisions. In addition, details of selected tax provisions are discussed and web-based exercises are available.

Macnaughton, A., and D. B. Thornton. 2001. Microeconomic and decision-based tax pedagogy: Canadian applications. In *Methods, Topics and Issues in Tax Education: A Year 2001 Perspective*, edited by J. A. Meade. Sarasota, FL: American Taxation Association.

Their chapter in this monograph illustrates two tax-planning strategies in Canada, one personal and one corporate. The personal strategy pertains to child-support payments and the corporate strategy concerns raised capital using "soft currency loans." Both exemplify the microeconomic approach in several ways, such as recognizing all parties to transactions and nontax costs. Extensions of the microeconomic approach are presented as well.

Thornton, D. B. 1993. *Managerial Tax Planning: A Canadian Perspective.* Toronto, Canada: Wiley.

The text discusses tax strategies and decision making from a managerial perspective, with illustrations drawn from the Canadian tax system.

In addition to these resources, many unpublished works are available. Among the best of these are those of Douglas Shackelford, who developed an extensive set of teaching aids for his Taxes and Business Strategy course at The University of North Carolina. Professor Shackelford's materials include his syllabus, lecture notes, and exams and can be obtained via the teaching consultants' section of the American Taxation Association web site (http://www.uni.edu/ata/teaching-consultants.htm).

CORRESPONDENCE WITH OTHER MODELS

Teaching the microeconomic approach to undergraduates and graduate students in accounting is consistent with the recommendations of the Accounting Education Change Commission (ACEE). In *Position Statement Number One—Objectives of Education for Accountants* (1990), the AECC calls for a new emphasis on enhancing students' skills in general problem solving, analytical reasoning, critical thinking, communications, interpersonal skills, and advanced technology. Skills and information consistent with lifelong learning should be stressed, while memorization and short-lived technical detail should be de-emphasized. As discussed earlier, analytical reasoning and critical thinking are emphasized by the microeconomic approach. The approach is also supportive of lifelong learning because it focuses on methods useful for current as well as future tax-law regimes. Moreover, it facilitates analyzing the effect of prospective tax law changes on a variety of economic decisions such as retirement planning, business entity selection, international taxation, and the like.

How does the microeconomic approach compare with the traditional technical/compliance approach (TC) and the AICPA Model Tax Curriculum (AICPA)? The latter two approaches are similar to each other because (1) they focus primarily on technical and compliance aspects of taxation, and (2) tax planning is generally not considered in a systematic or comprehensive fashion. The key difference between the TC and AICPA approaches is the order in which material is covered and the relative emphasis on individual topics vs. entity-oriented topics. Individual topics receive earlier and more extensive treatment with the TC approach. In contrast, the hallmark of the AICPA approach is its greater emphasis on entities (C corporations and flow-throughs), beginning with the first tax course.

The microeconomic approach emphasizes that optimal (efficient) tax planning is achieved in the context of a decision-making framework, as described above. In contrast to the TC and AICPA approaches, the microeconomic approach is flexible with regard to coverage of detailed tax rules. These can be taught with varying degrees of attention. For example, the first edition of the text by Scholes and Wolfson (1992) offers fairly little in the way of tax-law detail. However, courses based on this text can add technical detail from other sources such as chapters from tax texts and/or cases.

Whatever approach is adopted, teaching the microeconomic approach takes a sizable amount of time in a course. My experience at Indiana University with the first tax course for accounting undergraduates indicates that roughly one-third of the course is devoted to the microeconomic

EXHIBIT 15
Concept Map for Introductory Taxation

Scholes/Wolfson Tax-Planning Framework

Time frame: Multiple years

Basic Concepts

Efficient tax-planning goal:
  Maximize after-tax
  profitability
SW Framework themes:
  All parties
  All tax costs and benefits
  All nontax costs and benefits
Marginal tax rate (t)
After-tax cash flow model
After-tax profitability measures
  IRR, FV, PV
Tax clienteles
Frictions
Restrictions

Applications

Savings vehicles
  Capital gains tax rate (g)
  Deferral
  Pension fund deductibility
Organizational form
  Non-flow-through
  Flow-through
International tax (introduction)

Tax Compliance Framework

Time frame: Single year

General Tax Formula

  Total income
− Exclusions

  Gross income (tax return)
− Deductions

  Taxable income
× Tax rates

  Regular income tax liability
  before credits
− Credits
+ Other taxes

  Total tax

Individual Tax Formula

  Total income
− Exclusions

  Gross income (tax return)
− Deductions for AGI

  Adjusted gross income (AGI)
− Personal and
  dependency deductions
− Itemized deductions

  Taxable income
× Tax rates

  Regular income tax liability
  before credits
− Credits
+ Other taxes

  Total tax

approach itself, rather than tax-law details. However, once the tax-planning framework is taught, technical tax material is taught in the context of the framework. For example, as students learn traditional depreciation material, they also learn how to use present-value analysis to choose between slow and rapid depreciation methods for taxpayers in differing marginal tax rate circumstances. Spreadsheets are used to facilitate application of the framework.

Teaching some amount of technical/compliance material along with the microeconomic approach adds a healthy element of realism and practicality. At Indiana University in a first tax course for undergraduates, I spend one day covering the individual income-tax formula, basic itemized deductions, the standard deduction, and personal and dependency exemptions. I then use a concept map (Exhibit 15) to show the linkage between the Scholes/Wolfson tax-planning framework and what I call the "tax compliance framework." The class discusses how the tax compliance framework results in taxable income and, in turn, the taxpayer's marginal tax rate. I then draw a line connecting taxable income in the right-hand column with the marginal tax rate in the tax-planning framework column (left) and remind students about the role of the marginal tax rate in tax planning. In the last portion of the class session, we complete a Form 1040 and Schedule A based on a simple fact pattern, and then relate key items on the forms to the tax compliance framework. The major point of the exercise is to show one important linkage between tax compliance and tax planning.

CONCLUSION

The microeconomic approach emphasizes the role of taxation in decision making. It is composed of three elements: (1) a set of algebraic equations (analytical models), (2) subjective and other factors not included in the equations, and (3) descriptions of rules and concepts. This approach to teaching taxation can be used at the graduate and undergraduate levels and is consistent with the recommendations of the AECC (1990). Instructors can include varying degrees of technical tax material at their option. Several books and a variety of other materials are available to facilitate teaching the microeconomic approach.

REFERENCES

Accounting Education Change Commission (AECC). 1990. *Objectives of Education for Accountants*. Position Statement Number One. Sarasota, FL: American Accounting Association.

Anderson, K. 2000. Taxes and investment planning. In *Federal Taxation: Individuals*, edited by T. Pope, K. Anderson, and J. Kramer. Englewood Cliffs, NJ: Prentice Hall.

Engel, E., M. Erickson, and E. Maydew. 1999. Debt-equity hybrid securities. *Journal of Accounting Research* 37 (Fall): 249–274.

Erickson, M., and S. Wang. 1999. Exploiting and sharing tax benefits: Seagram and DuPont. *The Journal of the American Taxation Association* 21 (Fall): 35–54.

———, and ———. 2000. The effect of transaction structure on price: Evidence from subsidiary sales. Unpublished manuscript, University of Chicago.

———. 2000a. Evaluating the WorldCom/MCI merger. Presented at the Midwest AAA Meeting, Indianapolis, Indiana, April 15.

———. 2000b. Analysis of the tax and financial accounting consequences of Quaker Oates' sale of Snapple to Triarc. Presented at the Midwest AAA Meeting, Indianapolis, Indiana, April 15.

Jones, S. M. 2000. *Principles of Taxation for Business and Investment Planning*. New York, NY: Irwin McGraw-Hill.

Macnaughton, A., and D. B. Thornton. 2001. Microeconomic and decision-based tax pedagogy: Canadian applications. In *Methods, Topics and Issues in Tax Education: A Year 2001 Perspective,* edited by J. A. Meade. Sarasota, FL: American Taxation Association.

Scholes, M. S., and M. A. Wolfson. 1992. *Taxes and Business Strategy: A Planning Approach*. Englewood Cliffs, NJ: Prentice Hall.

———, ———, M. Erickson, E. Maydew, and T. Shevlin. 2001. *Taxes and Business Strategy: A Planning Approach*. 2nd edition. Englewood Cliffs, NJ: Prentice Hall.

Stern, J. J., and J. A. Seida. 1998. Extending Scholes/Wolfson for post-1997 pension investments. *The Journal of the American Taxation Association* 20 (Fall): 100–110.

———, and ———. 2000. *Tax Concepts and Analysis*. Bloomington, IN: Academic Products.

Thornton, D. B. 1993. *Managerial Tax Planning: A Canadian Perspective*. Toronto, Canada: Wiley.

Wilson, G. P. 1992a. Legal structures and management reporting structures. Unpublished manuscript, Boston College.

———. 1992b. Parker-Spencer case questions. Unpublished manuscript, Boston College.

———. 1992c. Parker-Spencer take aways. Unpublished manuscript, Boston College.
———. 1992d. *Parker-Spencer: The Legal Form of Joint Ventures.* Case No. 9192155. Boston, MA: Harvard Business School.
———. 1992e. Tax issues related to joint ventures. Unpublished manuscript, Boston College.
———, and J. Katz. 1992. *Whelan Pharmaceuticals.* Case No. 192066. Boston, MA: Harvard Business School.