Tax Reform and Capital Formation

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According to a growing number of influential critics, the prevailing federal income tax laws have become highly inequitable and are an obstacle to economic growth. In seeking more equitable and neutral taxes, many have proposed a thorough overhaul of the codes. Prominent among the proposals are two congressional plans, Bradley-Gephardt and Kemp-Kasten, and two Treasury plans, Treasury I and the President's tax proposals of May 1985, hereafter referred to as Treasury II. In attempting to correct the perceived problems in the current internal revenue codes, each of the four proposals would alter both the distribution of the income tax burden and the incentives that the codes bestow on savers or investors. Each proposal contains its distinctive compromises in balancing equity against investment incentives.

This paper examines how each of the four proposals for federal income tax reform might alter investment spending by changing the taxation of corporate income. As a first step toward assessing the potential influence of these plans on capital formation, this approach isolates the effects of their changing: (i) corporate income tax rates, (ii) formulas for depreciation allowances, (iii) investment tax credits, or (iv) allowances for the deduction of corporate dividends from taxable profits. This study is not a comprehensive evaluation of the basic principles behind each plan, nor does this study consider how these reforms may influence capital formation by altering households' propensities to save,

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by modifying the real after-tax yields in credit markets, or by changing the rate of growth of GNP. This paper also does not consider how great investment spending ought to be.

The Bradley-Gephardt proposal, often called the Fair Tax, appears to be designed primarily to achieve a specific standard of equity in measuring and taxing income. This plan does not necessarily attempt to enhance or even sustain the levels of investment incentives offered by the current revenue code. Not surprisingly, then, this study finds that Bradley-Gephardt fosters less investment spending than either the current revenue code or the other three tax reform proposals. Supporters of this plan apparently believe the best policy is to tax income "equitably," and then rely on other fiscal policies or monetary policy, if necessary, to encourage the desired rate of capital formation.

The Kemp-Kasten proposal, by contrast, appears to be designed primarily to achieve a specific standard of neutrality in taxing investment income. By doing so, it may better integrate corporate and personal income taxes. This study concludes that Kemp-Kasten fosters more investment spending than current tax law, and it may enhance capital formation as much as the Treasury plans.

The Treasury plan of late 1984 shares some of the philosophy behind both the congressional plans. Treasury I sought a "fair" tax by closing loopholes and by attempting to tax only economic income. At the same time it strives for a more neutral tax treatment of investments and a greater integration of corporate and personal taxes. According to the results of this study, the Treasury I proposal may foster the least investment during its first decade, because some of its investment incentives are introduced slowly. But over longer intervals, this plan should encourage a rate of capital formation exceeding that of current law and rivaling that of the Kemp-Kasten plan.

The Treasury II plan, introduced in 1985, is similar to Treasury I in many respects. But this second plan does not integrate the corporate and personal taxes nearly as much as the first, nor does it offer some of the features of Treasury I that were designed to measure and tax economic income consistently. This plan initially may encourage more investment spending than Treasury I, but in the long run both Treasury I and the Kemp-Kasten plan may foster more capital formation.

The first section of this paper describes some of the problems of defining a "neutral" tax. The second section introduces the four tax reform proposals. The macroeconomic consequences of these proposals on business capital spending are examined in the third section, and some of the industry-specific consequences are described in section four. The paper concludes with the fifth section.

What Is a Neutral Income Tax?

Since the inception of the science, economists have recognized that tax rules may not be neutral, because they can alter the relative prices among goods, the allocation of resources, or the distribution of income. According to many of today's neoclassical theories, even the simplest of income taxes hinders business capital formation by fostering consumption spending and by encouraging investors to purchase consumer durables, owner-occupied dwellings, or other assets that yield implicit income which escapes taxation. If the income tax code also includes a corporate income tax that has not been integrated properly with the general personal income tax, business investment spending may be deterred all the more.[1] Consequently, the prevailing revenue code is not regarded as a neutral tax.

According to the most stringent standards, for a tax to be neutral neither the relative prices of goods and services nor the allocation of resources should depend on tax rates or other features of the tax rules. By this severe definition, no tax is neutral, so policymakers have turned to a variety of less demanding standards. For example, considering only the *direct* consequences of taxing the returns on capital, a neutral tax might levy equal effective tax rates on all investments; it might leave the relative "take-home pay" on investments unchanged; or it might not alter the relative costs of using capital goods. Because no tax satisfies the stringent definition of neutrality, a revenue code that is neutral according to one of these alternative definitions may not be neutral according to the others under all circumstances. Furthermore, a revenue code that is neutral in the context of one model of economic behavior may not be neutral in another model, even though the definition of neutrality is the same in both cases.

Even by the less stringent standards suggested above, the prevailing income tax codes that apply to businesses are not neutral. A simple neoclassical model of investment behavior may illustrate best both the commonly mentioned problems with the current law and the types of reform needed to make the revenue code more neutral among business investments. In this model m firms each have invested in a specific

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[1]See for example A. Auerbach, *The Taxation of Capital Income* (Harvard University Press, 1983); M. Feldstein, *Capital Taxation* (Harvard University Press, 1983); and C. E. Steuerle, *Taxes, Loans, and Inflation* (Brookings Institution, 1985).

According to Keynesian theory, however, business capital formation need not be hindered by such a reduction in the propensity to save. See, for example, the "paradox of thrift," as described in J.M. Keynes, *The General Theory of Employment, Interest, and Money* (Harbinger Book; Harcourt, Brace and World, Inc., 1965), pp. 106 (last paragraph, Chapter 8), pp. 210–213 (first section, Chapter 13), pp. 358–371 (seventh section, Chapter 23), and Chapter 12.

machine tool. With no corporate income tax, each firm purchases this equipment until the present value of the marginal revenue product for the last machine equals the price of the machine:

$$P = \sum_1^{N^f} MRP_i^f/d_i \quad f = 1,\ldots,m. \tag{1}$$

The service life of this machine may vary among the firms (N^f), and the streams of marginal revenue product ordinarily will not be the same for many firms.[2] For simplicity, all investors use the same set of discounts (d_i).

The pattern of decay of the revenue product is the economic depreciation of the machine tool. Although the physical decay of the tool, as established by engineering studies, will be the same for all firms, the rate of economic depreciation will vary across firms. Because different industries expect different rates of technical progress in their production techniques, the machine tool may have a shorter expected useful lifespan in some industries, while in others the machine may be expected to sustain its productivity better in later years. Furthermore, different industries ordinarily use different types of labor skills or raw materials in producing their specific goods or services. Consequently, differences in the relative prices of labor, materials, or output that are expected to prevail during the life of the machine will make the anticipated economic depreciation (as well as the measured decay of the marginal physical product) of the machine vary across firms.

If a flat tax were levied on the revenue product of investments, ignoring the general equilibrium adjustments, the direct effect of the tax would be to reduce the net marginal revenue product and the demand price for the machine proportionately for all firms:

$$P_\tau = (1-\tau) \sum_1^{N^f} MRP_i^f/d_i = (1-\tau)\ P, \ f = 1,\ldots,m. \tag{2}$$

Under these very limited conditions, the tax is neutral among corporate investors because the effective tax rate is the same for all, and the tax does not directly alter the relative demand prices or returns prevailing

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[2]These differences arise because of relatively imperfect or illiquid markets for used capital goods. Three commonly mentioned grounds are: high transactions and installation costs; imperfect information about the quality of used capital (the possibility of "lemons"); and relatively high conversion costs (capital goods are frequently "customized" when first installed). See also the observations concerning the problems with measuring the quantity of capital goods cited at the end of footnote 3.

Of course, unless the firms never intend to sell these machine tools, (1) may misstate the equilibrium condition. The equation fails to include the cost of reselling the machine. For each firm, (1) implicitly states that the disposal value is the present value of the remaining marginal product for that firm.

across corporations or investment goods.

The current tax rules that apply to businesses are more complicated than this flat tax. The tax law specifies different rules for measuring the taxable incomes of different firms or different types of capital goods, and the law at times sets different tax rates for firms according to their size, their legal status (corporation, proprietorship, partnership, cooperative, or trust) or their line of business.

In the case of the machine described above, the m firms (all large, profitable nonfinancial corporations) are taxed according to a statutory measure of earnings (E_i) which does not necessarily match revenue product. The firms also are entitled to claim investment tax credits (at a rate k) and depreciation allowances (according to a schedule of rates, D_i, $i = 1, \ldots, T$). Therefore, for the last machine purchased by each firm:

$$P_\tau = k\ P_\tau + \sum_1^{N^f} MRP_i^f/d_i - \tau(\sum_1^{N^f} E_i^f/d_i - P_\tau \sum_1^T D_i/d_i).$$

Or, somewhat more simply

$$P_\tau = (1-k)^{-1}\ (P - \tau(\sum_1^{N^f} E_i^f/d_i - P_\tau \sum_1^T D_i/d_i)). \qquad (3)$$

Although the investment tax credit is widely regarded as an undisguised tax incentive, depreciation allowances appear to have some grounds for representing business expenses. Because maintenance and repair expenses are accounted for separately, depreciation allowances represent the inevitable wasting of the asset, a kind of economic depletion allowance or reserve. Without taxes, this depletion of the capital asset is reflected in the pattern of decay of the revenue product. Otherwise, there is no separate depreciation expense (other than maintenance and repairs) to be considered in measuring the return on a specific investment. Nevertheless, businesses wishing to maintain their output will establish a depreciation reserve: the decline in revenue product from existing investments will require undertaking new replacement investments. The reserve, therefore, dictates how much of current profit must be retained to purchase new capital if the firm is to conserve its size. In this sense, the depreciation allowance is not to be deducted from revenue product to measure the profitability of investment; instead, for conservative or growing businesses it is a claim on cash flow for funding new replacement investments. Consequently, depreciation allowances may be interpreted not as a surrogate for business expenses incurred by using existing assets, but as a delayed tax subsidy which may help fund subsequent replacement investments or dividend payments to stockholders.

The tax rules, as described in (3), would be neutral (in the less stringent sense) over all investments qualifying for tax credits and among all profitable corporate investors taxed according to these rules, if the second term in the braces were proportional to the present value of the stream of pretax marginal revenue product (P). Although the effective tax rates may vary across investments, the relative demand prices of capital goods would not depend on the tax rate or other features of the tax rules. But the schedule of depreciation allowances, fixed by law, is not related to each firm's stream of revenue product, and the pattern of taxable investment income may be related only loosely to the revenue product of capital. As a result, the second term in the braces probably will not be proportional to P. Moreover, the rate of the investment tax credit varies among investment goods. Consequently, in this simple neoclassical model, the current corporate income tax is not neutral by any reasonable standard.

Over the years tax policy advisors have suggested different reforms for making the tax codes more neutral. The most sweeping suggestions advocate the elimination of all business taxes or the complete integration of corporate and personal income taxation. A second set of more modest suggestions would require:

(i) measures of taxable investment income (before deductions for depreciation allowances) that match the revenue product of capital;

(ii) the elimination of the investment tax credit; and

(iii) the revision of depreciation schedules, either allowing investors to deduct from taxable income the full price of investment goods at the time of purchase or specifying schedules of depreciation allowances whose present values *always equal* the prices investors pay for capital goods.[3]

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[3]With these three measures, (3) becomes

$$P_\tau = P - \tau(P - P_\tau)$$

As a result $P_\tau = P$ for all investment goods, for all firms. All three of these measures are required to obtain this result. In particular, if (ii) were changed allowing businesses to claim "economic depreciation," then the present value of depreciation allowances would not equal the price investors pay for capital goods (P), and the tax law would not be neutral. (In view of previous comments, it also is not clear that *one* schedule of "economic depreciation" may be defined for each capital asset. Many common approaches seem to appeal to the concept of "engineering depreciation.")

If the patterns of economic depreciation (the decay of marginal revenue products) were identical for all firms, then neutrality need only require that depreciation allowances correspond to this pattern of economic decay. (P.A. Samuelson, "Tax Deductibility of Economic Depreciation to Insure Invariant Valuations," *Journal of Political Economy*, vol. 72 (December 1964), pp. 604–6.) This observation no doubt inspired the appeal to "economic depreciation" in the Treasury I and Bradley-Gephardt proposals. Of course, this uniform pattern of decay also must not be influenced by changing economic conditions (the term

Under either of these two sets of proposals (3) above becomes

$$P_\tau = \sum_1^{N^f} MRP_i^f/d_i = P \tag{4}$$

for all investment goods, for all firms. The effective tax rate for all investments, corporate and noncorporate, on the margin is zero (ignoring personal taxes), and the relative prices of investment goods do not depend directly on the corporate tax rules. The second set of proposals would allow for a corporate income tax on the income of capital goods that earn more than marginal returns.[4] The corporate income tax would become a tax on oligopoly profit or on the economic rent earned by inframarginal investments whenever production functions exhibit decreasing returns for capital.

Whereas these two sets of proposals, by virtue of (4), would treat all investment goods and investors the same on the margin, the simple flat corporate income tax, which led to (2), would discriminate directly against corporate investors in this model. With the flat tax, owners of corporations would be taxed twice on their marginal investments, unlike other investors who would pay, at most, only personal income taxes on their returns.

Although the reform proposals that eliminate the corporate tax liabilities for marginal investors may claim a degree of neutrality, they appear to be unpopular for practical and theoretical reasons. The "biases" against investment inherent in the corporate tax codes have been well understood for decades. Yet, when lawmakers turn to the task of fostering capital formation, they have sought the maximum "bang" in investment spending per "buck" of tax revenue that they sacrifice. Re-

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structure of interest rates, relative prices of goods and factors of production, etc.) for this approach to be tenable. As explained before, these conditions probably are too strong to be believed.

The reform suggested in (iii) would also require a change in the capital gains tax for businesses. A firm selling an asset would report its receipts less the original price of the asset plus accumulated depreciation allowances (all adjusted for inflation) as ordinary taxable income.

The foregoing assumes that we can measure capital aggregates and therefore the price and productivity of these aggregates. For a telling criticism of this assumption, see, for example: D. Usher, ed., *The Measurement of Capital* (University of Chicago, 1980), esp. the two papers comprising Chapter 7, M. Brown, "The Measurement of Capital Aggregates: A Postreswitching Problem," and E. Burmeister, "Comment"; T. M. Stoker, "Completeness, Distribution Restrictions, and the Form of Aggregate Functions," *Econometrica*, 52 (July, 1984), pp. 887–907; and C. Ichniowski, "Micro-Production Functions Aren't Pretty: Firm-Level and Industry-Level Specification for Inputs and Outputs," National Bureau of Economic Research, working paper no. 1365, June 1984.

[4]See, for example, J. Sturrock, "Eliminating the Tax Discrimination Against Income from Business Capital: A Proposal," in Board of Governors of the Federal Reserve System, *Public Policy and Capital Formation*, April 1981, pp. 281–302.

ducing the corporate tax rate is, therefore, the least attractive policy. Lower rates would reduce the tax liability on income earned by past as well as new investments, whereas more generous tax credits and depreciation allowances may be limited to new investment projects alone.[5]

Furthermore, lawmakers have used tax credits, variations in depreciation schedules, and specialized definitions of taxable income to foster the demand for specific investment goods or to encourage the growth of deserving industries and regions. Neutrality (in the less stringent sense) apparently is not and perhaps should not be the single goal of tax policy. Given that no revenue code can be fully neutral, a "second best" revenue code may have a place for these traditional tax incentives in order to compensate for some of the unavoidable biases inherent in any tax law. Because tax revenues are used to finance public spending and government operations, traditional tax incentives also may complement other government policies, which are designed to alter the composition of GNP, the allocation of resources, or the distribution of income.

Finally, economists, lawyers, accountants, and businessmen do not agree with one another, or even among themselves, on the proper measure of the revenue product of capital goods. This dissension prevails because the concept of revenue product is defined by and depends on the specific economic model adopted. Without the perfect markets, the prevalence of equilibrium, and the degree of certainty assumed in the simple neoclassical model used above, for example, there is no unique measure of revenue product. In fact, the all-important ex ante returns to capital that influence investors depend on perceptions of future business conditions; furthermore, the accurate measurement of ex post profit also may depend on these intangible perceptions.[6] In the absence of an en-

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[5]See, for example, R. Kopcke, "The Efficiency of Traditional Investment Tax Incentives," in Board of Governors of the Federal Reserve System, *Public Policy and Capital Formation*, April 1981, pp. 163–75.

[6]See, for example, the debate on measuring corporate profitability: B. Malkiel, "U.S. Equities as an Inflation Hedge," in J. A. Boeckh and R. T. Coghlan, eds., *The Stock Market and Inflation* (Dow Jones-Irwin, 1982), pp. 81–96; F. Modigliani and R. A. Cohn, "Inflation and the Stock Market," in Boeckh and Coghlan, pp. 97–118; R. Kopcke, "Stocks Are Not an Inflation Hedge," in Boeckh and Coghlan, pp. 45–58; and R. Kopcke, "The Continuing Decline in Corporate Profitability and Stock Prices," *New England Economic Review*, July/August, 1982. Of course the measurement of the profitability of capital presumes that the quantity of capital can be measured. See the citations at the end of footnote 3 concerning problems in defining economic aggregates such as the quantity of capital, the prices of capital goods, and the productivity of capital.

If the stream of tax liabilities does not conform to the stream of revenue product in the same way for every firm, the tax system ordinarily will not be neutral, especially as economic conditions change. Therefore, as illustrated by the debates in the previous paragraph, ex post measures of income that do not depend on ex ante estimates of future performance may misrepresent the profile of economic income. If taxable income is defined to be such an ex post measure of income, then the correspondence between the streams of tax liabilities and revenue products will tend to vary across industries, and the tax system will not be neutral.

during consensus, we could interpret the various measures of taxable investment income as compromises among differing points of view.

Perhaps we should not expect to design an ideal income tax that, in every respect, will be at least as "neutral" as any alternative proposal. Our conception of neutrality is defined in terms of prevailing economic theory, currrent and prospective business conditions, and the social objectives of lawmakers. This conception generally changes over time, sometimes significantly, as our knowledge, our economy, and our social goals evolve. Consequently, tax reform proposals are perhaps best regarded as steps toward a destination that itself changes with experience.

Some Current Proposals for Income Tax Reform

The accumulation of tax incentives and reforms over the years has fashioned a tax code that many now regard as inequitable or an obstacle to growth. This widespread dissatisfaction has bred a variety of proposals for income tax reform, four of which are examined below. Although these proposals recommend many profound changes in the current tax codes, the following analysis considers only changes in the taxation of business income (table 1).

The Bradley-Gephardt Proposal

The Bradley-Gephardt plan would impose a uniform 30 percent tax rate on all corporate income and repeal the investment tax credit. Depending on their "asset depreciation range" guidelines (established in the Revenue Act of 1971), equipment would be assigned to one of six classes with lives of 4, 6, 10, 18, 28, or 40 years. Structures would be assigned to the 40-year class. For purposes of calculating depreciation allowances, investors could use highly accelerated 250 percent declining-balance schedules over the assigned life spans of durable assets. This formula for depreciation is designed to equate the present value of these allowances with the present value of actual capital consumption expenses, using a 10 percent discount rate. The Bradley-Gephardt proposal would repeal the current $100 dividend exclusion and raise the maximum capital gains tax rate from 20 percent to 30 percent.

This plan attempts to eliminate some "loopholes" or incentives in the revenue codes while retaining others. It takes no significant step toward the better integration of corporate and personal income taxes. Although the corporate tax rate is reduced, the loss of the investment tax credit and accelerated depreciation allowances (table 2) raises corporate income tax liabilities compared to existing law and two of the three other

Table 1
A Comparison of Selected Provisions of Four Current Tax Reform Proposals

	Treasury I	Treasury II	Bradley-Gephardt	Kemp-Kasten
Business Taxation				
Corporate Income Tax Rate	33%	15% on first $25,000 18% on second $25,000 25% on third $25,000 33% on profits above $75,000	30%	15% on first $50,000 25% on next $50,000 35% on profits above $100,000
Dividend Deduction	50%	10%	None	None
Investment Tax Credit	Repealed	Repealed	Repealed	Repealed
Depreciation Allowances	Simple declining balances over longer asset lives, indexed for inflation	Accelerated declining balances over longer asset lives, indexed for inflation	250% declining balances over longer asset lives	Accelerated allowances over somewhat longer asset lives, indexed for inflation
Interest Expense	Inflation premium not deductible	Fully deductible	Fully deductible	Fully deductible
Investment Taxation				
Maximum Capital Gains Tax Rate	35% with indexing	17.5% with no indexing or 35% with indexing after 1991	30%	17% with no indexing or 29% with indexing
Dividend Exclusion	Repealed	Repealed	Repealed	Repealed
Interest Income	Inflation premium not taxed	Fully taxable	Fully taxable	Fully taxable

Table 2
The Accumulation of Depreciation Allowances

	Number of Years Needed to Recover:		
	⅓ of Purchase Price	½ of Purchase Price	⅔ of Purchase Price
	Equipment		
ACRS	1¾	2½	3¼
Treasury I	2¾	4¼	6¼
Treasury II	2¾	2½	3½
Bradley-Gephardt	2	2¾	4¼
Kemp-Kasten	2¼	3	3¾
	Structures		
ACRS	4	6¼	9
Treasury I	11	19	29½
Treasury II	5	8	12
Bradley-Gephardt	5	8½	13¼
Kemp-Kasten	4	6¼	9

Note: Assuming 5 percent inflation, entries show the number of years required for real depreciation allowances to sum to the appropriate proportion of the average asset's purchase price.

proposals. In terms of achieving neutrality (as discussed in conjunction with equation (4) of the previous section), the Bradley-Gephardt plan does not attempt to set the present value of depreciation allowances to the purchase price of assets. Instead, these allowances are linked more closely to the engineering rate of decay of durable assets, assuming that the sum of the inflation rate and real discount rate is about 7 percent.[7] Variations in the expected rate of inflation not offset by variations in the real discount rate could alter the relative tax treatment of many capital assets.

This plan attempts to achieve a measure of fairness as defined by its authors, not theoretical elegance as defined by common neoclassical models of economic behavior.

The Kemp-Kasten Proposal

The Kemp-Kasten plan would impose a graduated corporate income tax that attains a maximum tax rate of 35 percent on incomes exceeding $100,000. This proposal also would repeal the investment tax credit. For purposes of calculating depreciation allowances, durable as-

[7]The pretax 10 percent discount rate used to define allowances is a 6.7 percent nominal discount rate after corporate taxes.

sets currently assigned to 3, 5, 10, 15, or 18-year ACRS classes would be, respectively, reassigned to 4, 6, 15, 20, or 25-year "neutral cost recovery" classes. Depreciation allowances also would be indexed so that the economic value of these allowances would not be diminished by rising prices. This approach is intended to equate the present value of depreciation allowances with the purchase price of durable assets, assuming a 3.5 percent real discount rate. Kemp-Kasten would repeal the $100 dividend exclusion, and it would give taxpayers receiving capital gains a choice of tax rules: either exclude 40 percent of these gains from income taxation, or exclude from income taxation that portion of capital gains that merely represents inflation.

The Kemp-Kasten plan attempts to achieve a more neutral tax treatment of business investments. The repeal of the investment tax credit and the adoption of depreciation allowances whose present value equals the purchase price of durable assets (assuming a 3.5 percent real discount rate) closely matches two of the three requirements for a neutral tax presented in the previous section. These steps may well achieve a better integration of the corporate and personal income taxes as well. With the proper definition of taxable corporate income, they would eliminate the corporate tax burden on the all-important marginal investments according to the neoclassical model.

Treasury I (November 1984)

The Treasury proposal would tax corporate income at a rate of 33 percent, after allowing corporations to exclude one-half of dividends paid to stockholders from taxable income. The proposal would repeal the investment tax credit and replace ACRS with the "real cost recovery system" (RCRS). All durable assets would be assigned to one of seven depreciation classes and receive an invariant annual depreciation rate ranging from 32 percent to 3 percent. RCRS would permit businesses to adjust their depreciation allowances each year for rising prices so that the value of RCRS allowances would not vary with the changes in prices. This Treasury plan would reduce the tax deduction that businesses as borrowers can claim for interest that they owe on their indebtedness. Borrowers would not be allowed to deduct interest expenses that reflect the "inflation premium" in interest rates, and lenders would not pay taxes on the inflation premium in their interest incomes. This plan, like the previous plans, would repeal the dividend exclusion. The maximum capital gains tax rate would be 35 percent, but taxable gains would exclude the appreciation of assets due to inflation.

Treasury I shares some of the philosophy behind both the Bradley-Gephardt and the Kemp-Kasten proposals. Treasury I attempts to inte-

grate corporate and personal income taxes better by allowing for a considerable dividend deduction. It also strives for a degree of neutrality by repealing the tax credit, reducing the corporate tax rate, indexing depreciation allowances, interest income, interest expense, and capital gains and by reducing somewhat the tax incentives for household investments in durables. But this Treasury plan also sought a "fair" tax. Many of the measures above could be interpreted as closing loopholes; real depreciation allowances would be linked closely to the engineering decay of assets; and the proposal would attempt to tax only economic income.

Treasury II (May 1985)

The President's tax proposals, submitted to Congress in May 1985, feature a graduated corporate tax rate which rises from 15 percent to 33 percent for corporations with more than $75,000 of taxable income. This plan (hereafter, Treasury II) would entitle corporations to deduct from their taxable income one-tenth of dividends paid to shareholders. For purposes of calculating depreciation allowances, the Treasury II plan offers schedules that accelerate allowances somewhat more than the schedules of the first plan. Durable assets would be assigned to one of six classes with depreciation rates ranging from 55 percent to 4 percent. These allowances, like those of the first plan, would be indexed for changes in prices. Finally, the Treasury II proposal would repeal the dividend exclusion, but it would allow taxpayers to exclude one-half of capital gains from their taxable income, and, beginning in 1991, taxpayers could choose to exclude the portion of capital gains attributed to inflation instead of using the flat 50 percent exclusion.

Treasury II is in many respects similar to the previous proposal. But this second proposal does not integrate the corporate and personal taxes nearly as much as the first. Instead, it offers more accelerated depreciation allowances (table 2) to compensate for the reduced dividend deduction. This second plan also no longer proposes some of the features of the first (such as indexing interest income and expense) that were designed to measure and tax economic income more consistently.

The Macroeconomic Consequences of the Four Tax Reforms

In order to compare the potential influence on business capital spending of the four tax reforms discussed above, this paper uses two different descriptions of investment spending: the cash-flow and the neoclassical models. A previous study found that these two approaches

"explained" the recent course of investment spending rather well.[8] According to the cash-flow model, capital budgets rise and fall with the supply of funds generated by retained earnings and depreciation allowances. The neoclassical model uses business output, corporate income tax rates, the value of tax credits and depreciation allowances, interest rates, and the relative price of capital goods to explain investment spending. Although tax rules matter in both models, the cash-flow approach says that investment reacts to changes in *current* business tax liabilities, not future tax liabilities; whereas the neoclassical approach says that investment responds to changes in the present value of *current and future* tax liabilities.

The cash-flow model emphasizes liquidity constraints and uncertainties about the future, while the neoclassical model emphasizes the after-tax rate of return on investment over the life of the project. This profound distinction can divide the two models' assessments of tax reform. All four proposals, for example, would twist the schedule of depreciation allowances; compared to ACRS, they would diminish the deductions early in an asset's life in favor of subsequent deductions. According to the cash-flow model, this kind of reform would tend to reduce cash flow, at least temporarily, thereby reducing investment spending for a time. Should tax reform "stretch out" the schedule of depreciation allowances too severely, the cash-flow approach may even predict an enduring decline in business fixed investment. In a growing economy, the volume of tomorrow's new investments will exceed that of today's investments. Consequently, by the time investors begin to recoup the "postponed" depreciation allowances on today's investments, the postponed allowances on investments undertaken after today may be great enough to prevent cash flow from regaining its former path at any time during the future. Unlike the cash-flow model, the neoclassical model weighs the promise of greater deductions in the future along with today's lower deductions, so it may predict greater capital spending than the cash-flow model if ACRS were repealed. In fact, if tax reform introduces indexing which enhances the value of future allowances sufficiently, capital formation could even increase according to the neoclassical approach.[9]

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[8]R. Kopcke, "The Determinants of Investment Spending," *New England Economic Review*, July/August 1985.

[9]This study does not use "effective tax rates" to assess the consequences of the various tax plans, because all prominent descriptions of investment spending use various measures of sales, profit, the cost of capital, the return on investment, or the business cycle to explain the demand for capital goods. Taxes surely matter, but they influence capital formation only indirectly through profit, the cost of capital, or the return on investment. An effective tax rate cannot even be defined unambiguously without an appeal to a specific model of investment spending. Suppose, for example, a tax reform introduced an investment tax credit for construction expenditures but replaced ACRS with very conservative

Tables 3 to 7 summarize the simulations of the cash-flow and neoclassical models of investment spending over 20 years, running from 1981 to 2000. Although ACRS was enacted before these alternative proposals were conceived, the simulations all begin at the same time to compare the eventual effects of each plan, without giving ACRS the benefit of a head start. In all simulations real GNP grows 3 percent per year after 1984, and the rate of inflation, real rates of interest (after taxes), dividend/price ratios on common stock, and the relative prices of investment goods do not change after 1984.[10] Corporate profits before taxes and corporate dividend payments increase at the same rate as nominal GNP.

Although these simulations of the growth of the capital stock can be used to rank the four tax proposals against each other and against the current tax law, this ranking depends on the economic assumptions behind the simulations. For example, the rules that yield the greatest rate of capital formation, assuming that inflation and GNP growth remain constant as is done here, may not retain top honors should the economy experience sufficiently frequent or severe business cycles during the next 15 years. In the past, cyclical variations in the rate of inflation often altered the efficacy of investment tax incentives. Consequently the various 20-year simulations of the tax reform proposals are repeated three times in order to assess how changes in the rate of inflation may alter the consequences of each proposal. (See the appendix for

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depreciation schedules. This reform may be described as a tax cut, at least temporarily, by the cash-flow model, but the neoclassical model could regard it as a tax increase. Moreover, in the context of the cash-flow model, no measure of an effective tax rate could predict very accurately the response of investment spending to a tax reform unless this measure essentially were defined to be cash flow; a similar conclusion applies to the neoclassical model or any other prominent description of the demand for investment goods. Therefore, according to the two approaches used in this article, the course of business cash flow, sales, and the user cost of capital—not an effective tax rate—govern the pace of capital formation.

See also A. Auerbach, *The Taxation of Corporate Income*, cited in footnote 1, esp. chapters 2 and 3; and R. Kopcke, "Inflation, Taxation, and the Demand for Capital Assets," *Journal of Political Economy*, Vol. 89 (February 1981), pp. 122–131.

[10]Assuming that the real rate of interest (r) is constant implies that nominal yields equal $((1+r)(1+\pi)-1)/(1-t)$, where π is the inflation rate and t is the marginal corporate tax rate. Actual nominal yields typically have been less than those predicted by this formula in the past. (This discrepancy is partly due to the difference between corporate and personal income tax rates and to the lack of indexing in the corporate tax code. See R. Kopcke, "Why Interest Rates Are So Low," *New England Economic Review*, July/August, 1980. The four tax proposals tend to reduce the difference among personal and corporate tax rates, and, except for Bradley-Gephardt, they make the user cost of capital less sensitive to the rate of inflation.) Should the real cost of funds tend to decline with rising inflation in the future as it has in the past, the ranking of the proposals shown in tables 6 and 7 will not change drastically. The relative user costs do not change significantly with changes in the real rate of discount as is illustrated by tables A-1 and A-2 in the appendix.

more details about the models and the simulations.)

None of these simulations admit "multiplier effects." If one tax plan produced more investment spending than another, this additional investment would tend to foster a more rapid expansion of economic activity, which, in turn, would stimulate even more investment spending. By fixing the annual growth of GNP at 3 percent for all simulations, the results below may understate the differences among the various tax plans. Nevertheless, the basic ranking of the plans will not be altered by this absence of multiplier effects.

Finally, this study does not examine the tax treatment of business inventories. Under current law, businesses may account for the cost of goods removed from their inventories using First-In-First-Out (FIFO) or Last-In-First-Out (LIFO) methods. During periods of significant inflation FIFO understates the cost of these goods, thereby creating "inventory profits" on which businesses pay taxes. Although LIFO delays the payment of these taxes, this accounting method does not remove the potential tax liability on these inventory profits by revaluing inventories. Both Treasury proposals would allow businesses to adjust the value of goods taken from inventory for changes in prices due to inflation. Because the value of inventories was not indexed during the 1970s and early 1980s, the marginal tax rate on corporate profits may have been 20 percent greater than that set by law.[11] The following simulations may understate the influence of the two Treasury proposals on capital formation by omitting this treatment of inventory profits tax.

The Cash Flow Results

Under the conditions of the simulations, only the second Treasury tax proposal generally increases investment compared to ACRS (tables 3 and 4). Treasury II's lower corporate income tax rate, indexed depreciation allowances, and modest dividend deduction more than compen-

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[11]During the 1960s and 1970s the ratio of inventory profits (the inventory valuation adjustment) to nonfinancial corporate profits with inventory and capital consumption adjustments equalled roughly twice the inflation rate. (See R. Kopcke, "Are Stocks a Bargain," *New England Economic Review*, May/June 1979, pp. 5–24, esp. p. 23.) Therefore, with 10 percent inflation, taxable corporate profits would be overstated by 20 percent. A more modest inflation rate of 5 percent would increase the marginal tax rate on corporate profits from 46 percent to almost 51 percent, by taxing inventory profits.

If, for example, the user costs described in the appendix were altered by replacing the factor $(1 - TAX)$ in the denominator by $(1 - TAX\ (1 + 2\pi))$ for all tax schemes except the two Treasury plans, then the user costs for ACRS, Bradley-Gephardt, and Kemp-Kasten would be 6 percent greater with 3 percent inflation, 10 percent greater with 5 percent inflation, and 14 percent greater with 7 percent inflation. Accordingly, the capital stocks for these three tax schemes shown in tables 6 and 7 would tend to be reduced by 6, 10, or 14 percent, depending on the rate of inflation.

Table 3
The Stock of Producers' Durable Equipment—Cash-Flow Model
Billions of 1972 Dollars

	ACRS	Treasury I	Treasury II	Bradley-Gephardt	Kemp-Kasten
3 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	735	712	729	723	719
1990	932	882	916	869	869
1995	1087	1039	1075	997	1014
2000	1197	1177	1208	1114	1146
Average Annual Growth Rate (Percent)	3.4	3.3	3.4	3.0	3.2
5 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	734	712	729	723	719
1990	913	873	907	858	859
1995	1041	1018	1053	971	992
2000	1132	1148	1177	1077	1116
Average Annual Growth Rate (Percent)	3.1	3.2	3.3	2.8	3.0
7 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	734	711	728	722	719
1990	895	865	899	848	849
1995	1002	1000	1034	949	972
2000	1079	1125	1152	1048	1091
Average Annual Growth Rate (Percent)	2.9	3.1	3.2	2.7	2.9

Note: See appendix for details.

Table 4
The Stock of Nonresidential Structures—Cash-Flow Model
Billions of 1972 Dollars

	ACRS	Treasury I	Treasury II	Bradley-Gephardt	Kemp-Kasten
3 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	688	661	666	665	663
1990	767	747	761	745	744
1995	868	843	862	829	834
2000	959	939	959	912	925
Average Annual Growth Rate (Percent)	2.3	2.2	2.3	2.0	2.1
5 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	668	660	666	665	663
1990	761	744	758	741	741
1995	851	835	853	819	825
2000	929	926	945	896	911
Average Annual Growth Rate (Percent)	2.1	2.1	2.2	1.9	2.0
7 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	668	660	666	665	663
1990	755	742	755	738	737
1995	835	828	845	810	817
2000	904	915	933	882	899
Average Annual Growth Rate (Percent)	2.0	2.0	2.1	1.9	1.9

Note: See appendix for details.

sate investors for the loss of the investment tax credit and for the loss of highly accelerated depreciation allowances. Treasury I depresses capital formation at first, but during the last half of the simulation this proposal produces the most rapid growth of the capital stock, once the gradual introduction of its substantial dividend deduction is complete. Although the schedules of depreciation allowances in this first Treasury plan are not as accelerated as the schedules of allowances in Treasury II, the substantial dividend deduction in the first Treasury plan eventually yields the greatest cash flow. Kemp-Kasten supports a greater rate of capital formation than Bradley-Gephardt, but neither can support as much investment spending as the two Treasury plans.

Table 5 helps illustrate how each of the tax reform proposals would have affected cash flow in selected years. All the simulations in this table fix the path of investment spending to match that of the ACRS simulations with 5 percent inflation (tables 3 and 4). Under these circumstances, the Bradley-Gephardt proposal's comparatively large reduction of corporate income tax rates would increase cash flow about 5 percent in 1985 and 8.5 percent by the year 2000. The reduction of tax rates in the two Treasury plans and the Kemp-Kasten proposal are not as great; they would increase cash flow only 7 percent and 6 percent, respectively, by 2000.[12]

Because the Bradley-Gephardt plan's depreciation allowances are not accelerated as much as the ACRS allowances, that proposal would reduce cash flow about 4 percent in 1985 and 2.4 percent by 2000 as a result of the change in depreciation rules. While the depreciation schedules of the second Treasury proposal and the Kemp-Kasten proposal are not accelerated as much as ACRS, they are more accelerated than the Bradley-Gephardt allowances, and they are indexed for inflation. Consequently the depreciation allowances for Treasury II and the Kemp-Kasten proposal are sufficiently generous to add more than 5 percent to cash flow by 2000. Even though the depreciation allowances for the first Treasury proposal are indexed, by 2000 they would reduce cash flow almost 4 percent, because the depreciation schedules for Treasury I are not nearly as accelerated as those for the other tax reform proposals.

The first Treasury proposal eventually increases cash flow more than 13 percent as a result of its substantial dividend deduction. The less generous dividend deductions of Treasury II add less than 3 percent to

[12]From 1985 to 1990 pretax profits grow only 8 percent annually, while depreciation allowances grow 11.5 percent, due to the rapid accumulation of highly accelerated depreciation allowances in the ACRS simulation. As a result, taxable profits decline over these 5 years, making the reduction in corporate tax rates less valuable in 1990 than in 1985. After 1990, depreciation allowances rise more slowly than pretax profits, thereby increasing the value of the reduction in tax rates.

Table 5
The Effect of Tax Reform on Cash Flow
Percent of ACRS Cash Flow

	Total	Change in Cash Flow due to: Lower Corporate Tax Rate	Change in Depreciation Allowances	Repeal of Investment Tax Credit	Dividend Deduction
Treasury I					
1985	− .8	4.0	−8.0	−6.1	9.3
1990	−1.1	2.1	−7.5	−6.7	11.0
1995	4.5	4.6	−5.4	−7.0	12.3
2000	9.4	6.9	−3.7	−7.1	13.3
Treasury II					
1985	1.0	4.0	0.8	−6.1	2.3
1990	1.7	2.1	4.1	−6.7	2.2
1995	4.9	4.6	4.9	−7.0	2.4
2000	7.8	6.9	5.3	−7.1	2.7
Bradley-Gephardt					
1985	−5.4	4.9	−4.2	−6.1	0
1990	−7.0	2.5	−2.8	−6.7	0
1995	−4.0	5.7	−2.7	−7.0	0
2000	−1.0	8.5	−2.4	−7.1	0
Kemp-Kasten					
1985	−5.7	3.4	−3.0	−6.1	0
1990	−3.3	1.7	1.7	−6.7	0
1995	1.0	3.9	4.1	−7.0	0
2000	4.4	5.9	5.6	−7.1	0

Note: See appendix for details.

cash flow. Finally, all proposals reduce cash flow 6 or 7 percent by repealing the investment tax credit.

Altogether the first Treasury proposal would boost cash flow by more than 9 percent by the year 2000. The second Treasury proposal would add almost 8 percent to cash flow. Although Treasury I eventually overtakes Treasury II, for the first 15 years of the simulation Treasury II contributes the most to cash flow. Kemp-Kasten does not contribute as much as the two Treasury plans to corporate cash flow during this 20-year simulation, but after a slow start it gains steadily on Treasury II. Bradley-Gephardt also reduces cash flow substantially during the first five years of the simulation, but, unlike Kemp-Kasten, the Bradley-Gephardt proposal loses ground relative to the two Treasury plans during the full 20-year simulation.

Treasury I offers the least accelerated depreciation allowances. For this reason, this proposal supports the smallest rate of capital formation for the first five years of all simulations (tables 3 and 4). With 3 percent inflation, Bradley-Gephardt and Kemp-Kasten support nearly identical rates of investment spending for the first 10 years of the simulation, but neither fosters as much capital accumulation as ACRS or Treasury II. During the second half of the simulation with 3 percent inflation, Treasury II's capital stock surpasses that of ACRS; Treasury I's capital stock is rapidly catching up with that of Treasury II; and Kemp-Kasten's capital stock, having surpassed that of Bradley-Gephardt, is also rapidly gaining ground on ACRS as it catches up somewhat with Treasury II's capital stock.

Unlike ACRS and Bradley-Gephardt, the two Treasury proposals and the Kemp-Kasten plan index their depreciation allowances so that rising prices do not erode the purchasing power of these allowances. As a result, rising inflation reduces the capital stock in the year 2000 most for ACRS and Bradley-Gephardt. With 7 percent inflation, for instance, the two Treasury plans and Kemp-Kasten foster more capital formation by the year 2000 than does ACRS. Despite indexing, higher rates of inflation depress the capital stock somewhat for the Treasury plans and Kemp-Kasten as well, because depreciation allowances on investments made before 1981 are not indexed for these plans. In the long run, the rate of capital formation essentially would be unaffected by the inflation rate under the Treasury plans and Kemp-Kasten, so these simulations understate the advantages of these plans should inflation increase in the future. On the other hand, for rates of inflation much below 3 percent, the value of indexing becomes negligible, so ACRS and the Bradley-Gephardt plan would become relatively more attractive.

The Neoclassical Results

Here the Kemp-Kasten proposal and the two Treasury proposals produce the most rapid growth of the stock of producers' durable equipment and nonresidential structures (tables 6 and 7). Because the present value of Kemp-Kasten's depreciation allowances, by design, is very nearly equal to the purchase price of capital goods, this plan fosters the most investment spending throughout the 20-year simulation. Whereas the stocks of equipment and structures grow at essentially equal rates under the Treasury's first plan, Kemp-Kasten and Treasury II favor investment in structures.

In the cash flow simulation, the postponement of depreciation allowances initially tended to reduce cash flow and investment spending commensurately, but in the neoclassical model investors realize that postponed allowances eventually will be claimed—albeit the waiting reduces their value somewhat. Consequently, in the neoclassical simulation, the Kemp-Kasten plan and two Treasury plans support more capital formation than does ACRS throughout the 20-year period, because investors foresee the value of future depreciation allowances and the dividend deductions on the earnings of investments undertaken from the very beginning. With 3 percent inflation, the capital stocks of Kemp-Kasten and Treasury I surpass that of ACRS; Treasury II fosters nearly as much investment spending as ACRS; and Bradley-Gephardt supports the least capital formation.

Going behind these overall rankings, three of these four tax proposals tend to alter the composition of the capital stock. For example, compared to Treasury I or the existing ACRS investment incentives, Kemp-Kasten, Bradley-Gephardt, and Treasury II reduce the cost of capital proportionately more for structures than for equipment.

According to the neoclassical model, investors consider the value of depreciation allowances on *new* investments, not past investments, when ordering new capital goods. Consequently, the growth of the capital stock under Kemp-Kasten and the two Treasury plans is not affected by the rate of inflation, because these plans offer indexed depreciation allowances on new investments. Rising inflation reduces the rate of capital formation for ACRS and the Bradley-Gephardt plan, which lack indexed depreciation allowances. While ACRS may rival Treasury II for fostering investment at low rates of inflation, at 7 percent inflation the two Treasury plans and the Kemp-Kasten plan offer investment incentives that surpass those of ACRS by a wide margin. At 3 percent inflation ACRS encourages significantly more investment spending than Bradley-Gephardt. At 7 percent inflation the gap between the capital stocks of ACRS and Bradley-Gephardt is much smaller. Even though neither plan indexes depreciation allowances, because of Bradley-Gephardt's rela-

Table 6
The Stock of Producers' Durable Equipment—Neoclassical Model
Billions of 1972 Dollars

	ACRS	Treasury I	Treasury II	Bradley-Gephardt	Kemp-Kasten
3 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	713	728	718	693	721
1990	839	881	837	776	849
1995	969	1033	957	869	975
2000	1118	1203	1098	985	1123
Average Annual Growth Rate (Percent)	3.0	3.4	2.9	2.4	3.1
5 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	713	728	718	692	721
1990	826	881	837	771	849
1995	941	1033	957	858	976
2000	1078	1203	1098	969	1123
Average Annual Growth Rate (Percent)	2.8	3.4	2.9	2.3	3.1
7 Percent Inflation after 1984					
1980	615	615	615	615	615
1985	713	728	718	692	721
1990	815	881	837	767	849
1995	918	1033	957	849	976
2000	1044	1203	1098	956	1123
Average Annual Growth Rate (Percent)	2.7	3.4	2.9	2.2	3.1

Note: See appendix for details.

Table 7
The Stock of Nonresidential Structures—Neoclassical Model
Billions of 1972 Dollars

	ACRS	Treasury I	Treasury II	Bradley-Gephardt	Kemp-Kasten
3 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	673	708	705	677	749
1990	777	860	841	786	949
1995	900	1029	994	912	1168
2000	1041	1220	1168	1057	1411
Average Annual Growth Rate (Percent)	2.7	3.5	3.3	2.8	4.3
5 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	672	708	705	677	749
1990	765	860	841	779	949
1995	873	1029	994	897	1168
2000	1001	1220	1168	1035	1411
Average Annual Growth Rate (Percent)	2.5	3.5	3.3	2.7	4.3
7 Percent Inflation after 1984					
1980	611	611	611	611	611
1985	671	708	705	767	749
1990	755	860	841	773	949
1995	855	1029	994	887	1168
2000	973	1220	1168	1019	1411
Average Annual Growth Rate (Percent)	2.4	3.5	3.3	2.6	4.3

Note: See appendix for details.

tively low corporate tax rate, the declining value of depreciation allowances does not reduce cash flow for the Bradley-Gephardt plan as much as it does for ACRS.

The Loss of Tax Revenue

In the cash flow simulations, investment spending is tied directly to the concurrent cash flow of businesses. The plan that reduces business tax liabilities the most also produces the most investment spending, because the tax payment is the only element of cash flow that varies among the simulations. Therefore, the Treasury proposals foster the most rapid capital accumulation by reducing business tax payments by the greatest amount.

According to the cash-flow model, the difference in capital spending between two plans is essentially proportional to the difference between the concurrent tax burdens they place on businesses. Consequently, no tax proposal can be more "efficient" than another in the sense that the difference in capital spending between plans divided by their difference in concurrent government tax revenues is essentially a constant, 1.14.

Had these cash flow simulations allowed overall economic activity to vary directly with investment spending, the tax plans that produce the most investment also would tend to increase income tax revenues, because they would raise GNP and taxable incomes the most. Under these circumstances, the increase in capital spending divided by the *net* loss in government tax revenues could be greatest for the Treasury plans, which foster the greatest rate of capital formation. This is only a conjecture, however. The response of GNP to business tax reductions also depends on any changes in personal taxes. A greater business tax cut may be accompanied by higher personal tax rates, which could reduce consumption spending and business revenues, thereby depressing GNP growth or business cash flow. In assuming a constant 3 percent growth of real GNP for all simulations, this study has not considered some of the potential effects of revising personal taxes on capital formation.

In the neoclassical simulations, investment spending depends on the concurrent and future return on investment. Consequently, a plan that promises valuable tax reductions in the future may foster investment spending today with apparently little loss of tax revenue today. In the long run, however, these promised tax reductions may be very costly if they do not produce sufficient capital formation today.

Adhering to the specific concept of efficiency described above—which tax incentives deliver the greatest "bang" in capital spending per "buck" of prospective revenue loss—reducing the corporate income tax

rate is the least efficient investment incentive. While encouraging new investments, lower corporate tax rates reduce the tax liability on income earned by existing capital as well. Accelerated depreciation and investment tax credits, on the other hand, can be limited to new investment projects.[13] Because the first Treasury proposal and the Bradley-Gephardt plan rely relatively heavily on reducing the tax rate on corporate profits, the neoclassical approach suggests that the Kemp-Kasten plan and the second Treasury proposal provide more "efficient" tax incentives for investment.

Although this view is common, it does bear one considerable flaw. The double taxation of corporate profits discourages business capital formation. To ameliorate this deterrent, investment tax credits and accelerated or indexed depreciation allowances may be designed to offset the burden of corporate income taxes, but this strategy may prepare the way for substantial biases in the tax code. For instance, the value of depreciation allowances to any investor may vary with economic conditions. As a result, these allowances must be adjusted continually to prevent changes in the expected level or pattern of inflation, changes in the term structure of discount rates, changes in the relative prices of goods or factors of production, and other variables from altering the relative tax treatment of various capital goods or various industries. The changing economic conditions of the past three decades have warranted many such adjustments, including the enthusiastic promotion of ACRS in 1981 followed by the earnest appeal for tax reform by many former supporters of ACRS. Accordingly, the Treasury I plan's blend of dividend deductions and indexed depreciation may be a most attractive and practical approach to tax reform.

The Consequences of Tax Reform for Specific Industries

The foregoing results suggest that none of the four proposals for tax reform, if adopted, would treat all businesses the same. After all, these proposals were designed to rectify the current law's inequitable treatment of taxpayers, including businesses. Some proposals, for example, tend to reduce the tax liabilities of firms purchasing structures. These plans, therefore, would tend to boost the after-tax returns for firms in the structure-intensive printing industry relative to the equipment-intensive paper industry. Furthermore, because all four proposals would

[13]See also R. Kopcke, "The Efficiency of Traditional Investment Tax Incentives," in Board of Governors of the Federal Reserve System, *Public Policy and Capital Formation*, April 1981, pp. 163–75.

reduce corporate income tax rates, they would tend to reduce the tax burden most for industries with high ratios of profits to cash flow.

This study also examines how the various reform proposals would tend to alter the cash flow and user cost of capital for selected industries. The composition of the capital stock is assumed to remain constant for each industry, matching that of the late 1970s for the duration of the simulations. In the cash flow analyses, the rate of real investment for each industry, by assumption, increases its stocks of equipment and structures 3 percent per year. In this manner, the changes in cash flow that accompany each tax reform isolate the direct effect of these reforms on each industry. Inflation is set at 5 percent, so pretax earnings, dividends, and all other components of cash flow except for depreciation allowances and the tax liability grow approximately 8 percent per year.

The industrial simulations, like the aggregate simulations, show that Treasury I reduces the cash flow of most businesses during its first five years while its dividend deductions and tax rate costs are introduced gradually. Treasury I eventually tends to reduce the tax burden most for industries that use more structures than equipment in production and for industries that pay substantial dividends. Accordingly, this proposal would tend to increase the cash flow of manufacturing firms the most. However, textile firms and manufacturers of paper, rubber, or primary metals, which depend heavily on equipment or pay low dividends, would experience lower cash flow. Similarly agricultural, mining, transportation, and utility firms would have lower cash flow.

Treasury I and Treasury II tend to have similar effects on the pattern of cash flow among the industries. Although Treasury II offers a much smaller dividend deduction than Treasury I, Treasury II compensates by accelerating depreciation allowances, especially those for structures.

Like the Treasury proposals, the Bradley-Gephardt proposal would boost the cash flow of most manufacturing industries, while depressing the cash flow in agriculture, mining, transportation, and utilities. But Bradley-Gephardt does not reduce the tax burden for most manufacturers as much as the Treasury plans. Similarly, Bradley-Gephardt does not increase the tax burden as much on other industries.

The Kemp-Kasten proposal compared to current law and the other plans greatly increases the value of depreciation allowances for structures. As a result, this proposal would boost the relative cash flow of manufacturing firms considerably. In time, all manufacturing industries would have greater cash flows under Kemp-Kasten. But, for other industries, Kemp-Kasten would increase tax liabilities when compared either to current law or to the other reform proposals.

In many respects the results of the user cost simulations are similar to those for the cash flow simulations. Manufacturing industries generally benefit from a greater reduction in user costs than other industries.

The Kemp-Kasten plan tends to reduce the relative cost of capital for manufacturers the most; the Bradley-Gephardt plan reduces their relative user cost the least. While the two Treasury proposals seem to increase investment incentives more for manufacturers than other industries, these two plans appear to reduce the cost of capital more uniformly across industries than Kemp-Kasten. The Treasury plans do not appear to change the cost of capital for the various industries as uniformly as Kemp-Kasten. Here, as in the macro simulations, all tax reform proposals, except Kemp-Kasten, would reduce user costs for almost all industries. The Kemp-Kasten plan generally reduces the cost of capital the most, providing slightly greater incentives for investment than Treasury I.

Assuming that the appeals for tax reform do not arise from a lasting shift in fiscal policy designed to encourage investment in manufacturing, then adoption of any of these proposals may require other fiscal measures in order to maintain our industrial balance. It is not clear, in this case, that the resulting "distortions" in fiscal policy would be any less onerous than those present in current policy. If the fostering of investment in manufacturing is a welcome by-product of tax reform, then this reform might not endure if, for example, future economic conditions fostered a further expansion of manufacturing at the expense of other industries. Since their inception, governments intentionally have altered the composition of GNP, the allocation of resources, and the distribution of income in order to achieve best their community's goals. No doubt future tax reforms, like those past, will continue to heed the overall aims of policymakers as they manage fiscal policy. Consequently the tax reforms eventually enacted probably will not clash to a great degree with legislators' attitudes about a proper federal industrial policy. In this regard, the four proposals for tax reforms examined here do offer lawmakers some distinct choices.

Conclusion

The Reagan administration enthusiastically promoted the tax reforms enacted in 1981. But by 1984, the Administration strongly emphasized the need for overhauling much of the revenue code, while criticizing ACRS, introduced in 1981, for creating distortions and for failing to provide consistent investment incentives when economic conditions were changing. This is not an isolated event. Virtually all postwar administrations changed their opinions about proper or acceptable tax rules while they were in office.

If history is to offer us any instruction about tax reform, its foremost lesson is that our conception of right and proper taxation generally

changes as our knowledge, our economy, and our social goals evolve. Consequently, those who have sold past tax reforms as enduring policy changes and those who point to past "failures" in order to criticize current tax reform efforts may be guilty of misplaced emphasis. Tax reforms are best regarded as steps toward a destination that changes with experience.

This paper examines some of the consequences of four contemporary proposals for tax reform—two Treasury plans, the Bradley-Gephardt proposal and the Kemp-Kasten plan—assessing how they might influence the rate of capital formation by altering the taxation of investment income. The results suggest that the two Treasury proposals and Kemp-Kasten eventually would tend to increase the rate of capital formation compared to ACRS. Even though these three proposals for tax reform would repeal the investment tax credit and replace ACRS with less accelerated depreciation rules, they would boost investment by reducing corporate income tax rates, by indexing depreciation allowances, or by introducing a corporate dividend deduction. The first Treasury tax reform proposal of late 1984 might depress investment spending at first, but it eventually would tend to foster one of the most rapid rates of capital formation by taking a long step toward eliminating the double taxation of corporate profits.

Perhaps the most distinctive feature of the first Treasury proposal is its attempt to move closer to taxing only the economic income of households and businesses. Rising inflation during the 1960s and 1970s eroded the value of depreciation allowances, raising the tax burden on investors. A series of tax reforms culminating in the Economic Recovery Tax Act of 1981, designed to offset the effects of high rates of inflation, now appears to have made tax incentives for investment too generous during the early years of an asset's life. The first Treasury proposal attempts to link depreciation allowances to the economic rate of decay of durable assets, and it indexes these allowances for inflation. In this manner, the plan tries to achieve a more equitable measure of income that is not distorted by changes in the inflation rate.

The plan also could reduce the cost of capital for businesses by measuring the economic income of stockholders more accurately. Under current law, the effective tax rate on real capital gains varies greatly with the inflation rate. For example, during the high inflation of the 1970s effective tax rates on real capital gains frequently exceeded 100 percent. With the first Treasury plan, the effective tax rate on real capital gains would not change with the rate of inflation. Consequently the Treasury's proposal might make stocks more attractive investments. During the 1970s, many investors shunned the stock market once they realized that stocks were a poor inflation hedge, partly because the effective tax rate on corporate income and equity investments rose with the rate of infla-

tion. The Treasury's tax proposal might restore some of equity's appeal by indexing depreciation allowances, business inventory profits, and capital gains income: the effective tax rate of the returns to stockholders would no longer rise with the rate of inflation.[14]

Whether or not they are enacted, each of the four proposals can serve as models for designing future tax reforms. As such a statement of "first principles," the first Treasury proposal seems to be a useful foundation upon which to build. This is not to say that this Treasury plan embodies the essence of fair and neutral taxation. In a sense, no tax can be entirely neutral, and fairness is in the eye of the beholder. Future recessions or rising relative prices of capital goods once again may warrant lawmakers' studying special tax incentives for investment. A model tax plan is like an engineer's design for an efficient automobile or hotel. We may not adopt the design because we want fancy fenders or airy atriums. But the engineer's plan allows us to assess the costs and benefits of the features we might want, and the engineer's plan allows us to assess whether or not these features threaten the structural integrity of the finished product. A model tax code deserves study and understanding so that, at least conceptually, lawmakers can return to it in designing each new tax reform. In this manner, a model code may minimize the risk of the tax laws becoming a heap of complex, incompatible provisions, which demand annual reforms while confounding the understanding of lawmakers and taxpayers alike.

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[14]See R. Kopcke, "The Continuing Decline in Corporate Profitability and Stock Prices," *New England Economic Review*, July/August 1982; "Stocks Are Not an Inflation Hedge," in J. A. Boeckh and R.T. Coghlan, eds., *The Stock Market and Inflation* (Dow-Jones Irwin, 1982); and "The Decline in Corporate Profitability," *New England Economic Review*, May/June 1978.

See also D. Fullerton "The Indexation of Interest, Depreciation, and Capital Gains: A Model of Investment Incentives," National Bureau of Economic Research, Working Paper No. 1655, June 1985; and J. Tatom, "Federal Income Tax Reform in 1985: Indexation," Federal Reserve Bank of St. Louis *Review*, February 1985, pp. 5–12.

Appendix

The Cash Flow Model

$$IE_t = 2.12 + \sum_{i=0}^{5} b_i\,(CF_{t-i}/PE_{t-i}) + 3.13(.936)^t$$

$b_0 = .370$ $b_3 = .090$
$b_1 = .168$ $b_4 = .082$
$b_2 = .096$ $b_5 = .006$

$$KE_t = IE_t/4 + .957\ KE_{t-1}$$

$$IS_t = 12.71 + \sum_{i=0}^{5} b_i\,(CF_{t-i}/PS_{t-i}) + 1.85(.956)^t$$

$b_0 = .084$ $b_3 = .047$
$b_1 = .076$ $b_4 = .033$
$b_2 = .062$ $b_5 = .025$

$$KS_t = IS_t/4 + .984\ KS_{t-1}$$

where

IE, IS: quarterly investment in producers' durable equipment and nonresidential structures expressed in 1972 dollars;

KE, KS: stock of equipment and structures expressed in 1972 dollars;

PE, PS: price deflators for equipment and structures from National Income and Product Accounts;

CF: nonfinancial corporate business cash flow, retained earnings plus depreciation allowances, expressed at an annual rate;

t: a time index denoting the quarters; t equals unity in 1981:I.

The final term in both equations represents the prediction error of 1980:IV multiplied by the autocorrelation coefficient raised to the power t.

The entries in text tables 3 and 4 are the values of the KE and KS for the fourth quarters of the years shown. From 1981:I to 1984:IV, all simulations use historical values for CF, PE, and PS. Afterward, PE and PS grow at the assumed rate of inflation.

For the ACRS simulations, pretax profit grows at an annual rate equal to unity less the product of unity plus the inflation rate and unity plus .03 (the assumed rate of real growth). Dividends increase at this same rate. To accomplish a smooth transition from 1984 to 1985 and subsequent years, depreciation allowances after 1984 equal the sum of three components: $280 billion (book depreciation for nonfinancial corporations in 1984) times $(.92)^{(year-1984)}$; the ACRS allowances on subsequent investments undertaken after 1984; and a constant, $23 billion. The corporate tax rate equals .46 plus .54 times the average state corporate profits tax rate. Taxes equal the tax rate (as defined in the previous sentence) times the difference between pretax profits and depreciation allowances less the amount of the investment tax credit (.096 times PE•IE). CF then equals pretax profits less dividends less taxes plus depreciation allowances. Starting in 1985:I the calculated value of the investment tax credit was reduced by $6 billion in every quarter and the simulated value of CF was raised by $30 billion in every quarter to allow for a smooth transition. This lump-sum approach (rather than a lower effective tax credit and tax rate approach) seemed appropriate, because with continuing growth more corporate income would be taxed at the maximum prevailing marginal rate and "carry-forwards" or "carry-backs" would diminish in significance.

For simulations other than ACRS, CF equals CF as determined above less the change in taxes. The change in taxes equals the new maximum corporate tax rate times the change in depreciation allowances (ACRS allowances on investments made after 1980:IV less the appropriate tax plan's allowances on its simulated investments), plus the investment tax credits from the ACRS simulation, plus the change in the maximum corporate tax rate (the new maximum rate less the tax rate as defined in the previous paragraph) times taxable profits from the ACRS simulation, less the new maximum tax rate times the dividend deduction. The new maximum tax rate equals the proposed federal rate plus the product of the state tax rate and one minus the proposed federal rate.

For tax plans that allow businesses to invest more of their pretax cash flow (due to lower tax liabilities), no allowance is made for the more rapid growth of pretax profit in the future as a result of this greater rate of capital accumulation. This conservative assumption tends to understate the differences among the various tax plans, but it does not alter their basic ranking. (The neoclassical simulations "forecast" more rapid capital formation than the cash flow models partly because they recognize the return on investment that accompanies this capital deepening.) Because total fixed investment eventually rises $1.14 for every $1 of sustained tax cut, debt and interest expense must be rising faster in the simulations that foster more investment with greater tax cuts. The simulations conservatively assume that the increased profit on the additional investment that is financed by debt equals the service charges imposed by this additional debt.

The simulations of Treasury II do not include the "recapture" provisions that do not allow businesses to benefit both from ACRS depreciation schedules on investment undertaken from 1981 to 1985 and from the lower corporate income tax rates to be enacted after 1985. By starting all simulations in 1981, the recapture provisions are not necessary in this study. Should Treasury II, with recapture, be enacted in the future, the growth of the capital stock could be less than that of the Kemp-Kasten plan until the effects of the recapture have lapsed.

Implicit in these simulations is the assumption that the after-tax nominal rate of interest (hence the real rate of interest) is the same for all simulations. This same assumption applies to the neoclassical simulations. We adopt this assumption mostly because it is convenient (mostly, but not entirely—see footnote 10). Any reasonable alternative would require a complete model of the effect of tax reform on household saving and credit markets as well as on investment demand. As stated in the text, this undertaking is beyond the scope of this paper.

For text table 5, the various simulations as described above are repeated, except that inflation is fixed at 5 percent and the amount of investment spending in the simulations for the two Treasury proposals, the Bradley-Gephardt proposal, and the Kemp-Kasten proposal is constrained to equal that of the ACRS simulation.

The Neoclassical Model

$$IE_t = \sum_{i=0}^{12} b_i (Q_{t-i}/RE_{t-1-i}) - \sum_{i=1}^{13} c_i (Q_{t-i}/RE_{t-i}) + .089\ KE_{t-1} + 14.01(.942)^t$$

$b_0 = .021$
$b_1 = .030$
$b_2 = .034$
$b_3 = .042$
$b_4 = .045$
$b_5 = .045$
$b_6 = .044$
$b_7 = .042$
$b_8 = .038$
$b_9 = .033$
$b_{10} = .028$
$b_{11} = .021$
$b_{12} = .014$

$c_1 = .020$
$c_2 = .030$
$c_3 = .037$
$c_4 = .042$
$c_5 = .045$
$c_6 = .046$
$c_7 = .044$
$c_8 = .042$
$c_9 = .038$
$c_{10} = .033$
$c_{11} = .026$
$c_{12} = .019$
$c_{13} = .012$

$$KE_t = IE_t/4 + .957\ KE_{t-1}$$

$$IS_t = \sum_{i=1}^{10} b_i (Q_{t-i}/RS_{t-i}) + .0278\ KS_{t-1} + (.967)^t$$

$b_1 = .0013$
$b_2 = .0011$
$b_3 = .0009$
$b_4 = .0006$
$b_5 = .0004$
$b_6 = .0002$
$b_7 = .0001$
$b_8 = .0002$
$b_9 = .0004$
$b_{10} = .0007$

$$KS_t = IS_t/4 + .984\ KS_{t-1}$$

where

Q: business product expressed in 1972 dollars at an annual rate

RE, RS: User cost of equipment and structures, where

$$RE = (PE/P)\ (.15 + D)\ (1 - ITC - TAX\ (WE) - .3\ (1 - DEBT))/(1 - TAX)$$
$$RS = (PS/P)\ (.05 + D)\ (1 - TAX\ (WS) - .3\ (1 - DEBT))/(1 - TAX)$$

PE, PS are the implicit price deflators for producers' durable equipment and nonresidential structures, respectively. (U.S Bureau of Economic Analysis)

P is the implicit price deflator for GNP. (U.S. Bureau of Economic Analysis)

The economic rate of depreciation for equipment is estimated at .15 and structures .05.

D, the discount rate for corporate profits after corporate income taxes, equals the Standard & Poor's dividend/price ratio for common stocks plus an estimate of the real rate of growth of nonfinancial corporate enterprises, a constant 4 percent. This definition of D is inspired by the Gordon growth model for valuing equities. See for example T. Campbell, *Financial Institutions, Markets, and Economic Activity* (McGraw-Hill Book Co., 1982), esp. pp. 55–58.

ITC is the investment tax credit on equipment. Although many public utility structures are eligible for investment tax credits, we assume the effective tax credit for all corporate

structures is zero. As long as utility regulatory commissions enforce target rates of return, a higher tax credit may reduce revenues for utilities, rather than reducing the user cost of capital.

WE is the present value of depreciation allowances for equipment using the most "accelerated" formulas permitted by law. The discount rate used is .02 plus π. WS is defined similarly for structures. .02 represents the assumed real rate of return on bonds after taxes, a figure roughly consistent with the inflation forecasts given below assuming a tax rate of 40 percent.

π is the average inflation rate expected to prevail over the holding period of new bonds issued in each quarter. The values used in this series are as follows:

1976:I to 1977:IV	5.5%	1982:III	7.0%
1978:I to 1978:IV	6.0%	1982:IV to 1983:IV	5.5%
1979:I to 1979:IV	7.0%	1984:I to 1984:II	6.0%
1980:I to 1980:IV	8.0%	1984:III to 1984:IV	5.5%
1981:I to 1982:II	7.5%		

DEBT is the present value of debt service charges after taxes per dollar borrowed at the prevailing Aa new utility rate. The maturity of the loan equals the tax lifetime of the capital good. The discount rate is the same as that for WE.

According to the neoclassical model, in deciding whether to undertake an investment project, business managers compare the present value of the project's cash flow with its cost. A firm will then accept investments until the cost of the last project accepted equals its discounted cash flow. Supposing the equity to capital ratio is .7 and the present value of real economic returns before taxes is V (real returns depreciate 15 percent per year and the discount rate is D):

$$PE(.7) = P(1 - TAX)V + PE\,[-.3\,DEBT + TAX\,(WE) + ITC]$$

$$\text{or} \quad PE = P(1 - TAX)V + PE\,[.3(1 - DEBT) + TAX\,(WE) + ITC]$$

This equation yields the user cost of capital RE. (See for example R. E. Hall and D. W. Jorgenson, "Tax Policy and Investment Behavior," *American Economic Review*, June 1967, pp. 391–414.) The expected rate of change of PE/P is assumed to be negligible.

The final term in both equations represents the prediction error of 1980:IV multiplied by the autocorrelation coefficient raised to the power t.

For text tables 6 and 7, the entries equal the capital stock for the fourth quarter of each year shown. For all simulations Q grows 3 percent annually after 1984:IV, while all price deflators grow at the rate of inflation. In all user costs, the dividend/price ratio on common stocks and the real cost of debt finance are assumed to equal their values of 1984:IV in all subsequent quarters. Consequently, the present value of depreciation allowances, the corporate tax rate, and the amount of the investment tax credit are the only variables that distinguish the various tax plans from one another. ACRS alone features an investment tax credit of .096 in RE. For the two Treasury plans and the Bradley-Gephardt plan, the real depreciation allowances are discounted at a real rate of 2 percent. (We also calculated user costs with a 4 percent discount rate. See the tables below.) For ACRS and the Kemp-Kasten plan, depreciation allowances are discounted at the inflation rate plus 2 percent. Because the two Treasury plans allow a dividend deduction, which effectively reduces the marginal tax rate on taxable profits, the corporate tax rate in the denominator of their user cost formulas is reduced by assuming that one-half of taxable profits are distributed as dividends. (Since a dollar of depreciation allowances always can reduce taxable profits by one dollar, regardless of dividends, the present value of depreciation allowances in the two Treasury plans is multiplied by their respective maximal corporate tax rates.) During

the period when the dividend deduction is being introduced in steps, the rate of the effective dividend deduction equals a discounted value of present and future effective rates of dividend deductions.

The following tables show the user costs behind the neoclassical simulations. For the purposes of the simulations, we assumed a 2 percent real discount rate, after taxes. The tables also show user costs, assuming a 4 percent real discount rate. The switch to a 4 percent discount rate does not alter the relative ranking of the tax proposals' user costs. This switch would not alter the ranking of Kemp-Kasten's user costs on equipment or structures, each considered separately, but it would raise the overall user cost for the Kemp-Kasten plan relative to that of Treasury I so that both of these plans would have the same overall cost of capital. The Kemp-Kasten plan, therefore, would share top billing with Treasury I if the neoclassical simulations were repeated using a 4 percent discount rate.

Table A1
The User Cost of Capital: Equipment
Percent

	ACRS[a]			Treasury I	Treasury II	Bradley-Gephardt[a]			Kemp-Kasten
2 Percent Real Discount Rate									
1980[b]	.235			.235	.235	.235			.235
1981	.222			.208	.203	.256			.211
1982	.216			.200	.211	.253			.207
1983	.199			.180	.195	.225			.188
1984	.199			.178	.193	.225			.188
	3%	5%	7%			3%	5%	7%	
1985	.187	.196	.204	.173	.193	.217	.222	.226	.187
1986[c]	.187	.196	.204	.172	.193	.217	.222	.226	.187
4 Percent Real Discount Rate									
1980[b]	.245			.245	.245	.245			.245
1981	.230			.218	.212	.261			.222
1982	.225			.209	.219	.258			.218
1983	.206			.189	.200	.230			.199
1984	.207			.187	.199	.230			.198
	3%	5%	7%			3%	5%	7%	
1985	.196	.204	.212	.181	.199	.222	.226	.230	.197
1986[c]	.196	.204	.212	.180	.199	.222	.226	.230	.197

[a]Because depreciation allowances are not indexed for these plans, the user costs after 1984 depend on the assumed rate of inflation: 3, 5, or 7 percent.
[b]User costs equal those prevailing before the Economic Recovery Tax Act of 1981.
[c]User costs remain constant after 1985.

Table A2
The User Cost of Capital: Structures
Percent

	ACRS[a]			Treasury I	Treasury II	Bradley-Gephardt[a]			Kemp-Kasten
2 Percent Real Discount Rate									
1980[b]		.270		.270	.270		.270		.270
1981		.250		.194	.188		.240		.154
1982		.258		.197	.202		.250		.156
1983		.216		.169	.175		.209		.135
1984		.219		.168	.174		.208		.135
	3%	5%	7%			3%	5%	7%	
1985[c]	.200	.214	.225	.161	.174	.197	.204	.209	.133
4 Percent Real Discount Rate									
1980[b]		.272		.272	.272		.272		.272
1981		.260		.214	.209		.245		.185
1982		.267		.217	.221		.255		.191
1983		.222		.186	.191		.214		.164
1984		.223		.184	.190		.213		.163
	3%	5%	7%			3%	5%	7%	
1985[c]	.214	.225	.234	.177	.190	.204	.209	.213	.161

[a]Because depreciation allowances are not indexed for these plans, the user costs after 1984 depend on the assumed rate of inflation: 3,5, or 7 percent.
[b]User costs equal those prevailing before the Economic Recovery Tax Act of 1981.
[c]User costs remain constant after 1984.

Discussion

*George N. Hatsopoulos**

Tax reform has once again reached prominence among national economic issues. This is not surprising in view of the long-standing dissatisfaction of a majority of Americans who believe that the current tax system is unjustifiably complex and unfair. What is unusual this time around is that the present tax-redesign effort does not pretend to address the major economic problems of the day. It is not as though the current problems of our economy are less significant than those of the past: there is near consensus that the unprecedented deficits in our federal budget and our foreign trade are ominous. It is as though these problems are so overwhelming that relief is sought by diverting attention to what are thought to be the more manageable issues such as fairness and simplicity.

Fairness and simplicity are worthy long-term objectives for tax policy, but only if their attainment does not impair economic growth and employment. Mr. Kopcke implicitly addresses the question of economic growth by analyzing the effects of four major tax proposals (Treasury I and II, Bradley-Gephardt, and Kemp-Kasten) on the rate of capital formation. In addition, he discusses issues relating to the neutrality of the tax system, which affects growth by virtue of the efficiency of allocation of capital across productive activities.

Concerning neutrality, he concludes that whereas no tax system can be neutral in the strict sense of the word, some systems are more neutral than others. He states also that "our conception of right and proper taxation generally changes as our knowledge, our economy, and our

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social goals evolve." I fully agree. Concerning the rate of capital formation, he concludes that Treasury I and II and Kemp-Kasten eventually would tend to increase the rate of capital formation compared to present tax law. I disagree.

In my opinion all four tax-reform proposals examined will, for several years, retard capital formation and accelerate the decline of our international competitive position, not only in basic industries but high-technology ones as well. There are benefits that can be attributed to each of the four proposals in an ultimate equilibrium state, assuming the share of our manufacturing industry does not change. However, if any of those proposals are enacted in their present form, the damage inflicted during the transition period is likely to overshadow such long-term benefits.

There are two bases for my conclusion. One is analytical and the other is common sense. Let me start first with the latter, which usually turns out to be more dependable.

All four proposals increase overall business taxes substantially, at least for a transition period of several years. Moreover, they reduce tax rates on earnings from capital already in place—a windfall for past investors. The plans, therefore, must raise revenue by increasing taxes on new capital, counter to traditional wisdom that tax rates on new capital should be kept low to spur investment. Thus, U.S. manufacturers will be further motivated to use cash generated by fixed assets in the United States to finance investments abroad. In addition, liquidation of domestic assets will be facilitated by the lowering of personal tax rates under all plans and the dividend deductibility provisions of the two Treasury proposals. Eventually, three of the four proposals will reduce business taxes and improve capital-allocation efficiency, but the present value of such benefits will probably be more than offset by the shorter-term damage.

Let us now disregard, as Kopcke has done, the transition problems and discuss the analysis that has led to his conclusions concerning long-term equilibrium. He uses two models: the cash-flow and the neoclassical. I have problems with both models.

First, I do not believe that corporate cash flow motivates or should motivate investment. By and large, corporations make investments only if the discounted present value of after-tax earnings from such investments is greater than the cost of the investments.

Many corporations reduce their rate of investment during recessions, not because their cash flow is reduced, but because demand for their products is low. For these companies investment and cash flow seem to correlate simply because these two indicators are procyclical. It would be very surprising if the correlation persisted in the absence of a recession. Moreover, such a correlation does not apply to high-technology companies that have relatively fewer fixed assets and more inven-

tories and receivables. They enjoy increasing cash flow but invest less during recessions. In any case, Kopcke does not seem to put much weight on the cash-flow model since its results mostly contradict his final conclusions.

The neoclassical model requires the evaluation of the user cost of capital for each class of assets considered. Kopcke considers two classes of assets—equipment and structures—but not inventories, receivables, or land. I differ with him in his calculations of the cost of capital on several points.

In the traditional calculation of the user cost of capital, first introduced by Hall and Jorgenson, all cash flows from an investment, including taxes and tax credits, are discounted by the marginal after-tax cost of funds, which combines the cost of equity and the after-tax cost of debt in some proportions. Kopcke departs from this approach. He discounts the economic returns before taxes by the cost of equity and discounts all other cash flows by a lower fixed real rate of return plus inflation. His rationale is that the only cash-flow stream that is uncertain and, therefore, warrants the risk premium included in the cost of equity, is the project's economic return—after all, tax credits, depreciation allowances, and interest payments on bonds involve no uncertainty.

I object to this procedure for two reasons. First, the risk premium reflected in the cost of equity, which Kopcke uses to discount the risky cash flows, is too low. The observed required return on equity reflects the investor's discount rate on all corporate cash flows, both risky and riskless. The discount rate investors apply to the risky component alone is, therefore, substantially greater than the cost of equity. Second, many of the cash flows which are modeled as certain, for example depreciation allowances, are in fact uncertain since many firms may pay no corporate taxes in some future years.

To project interest rates post enactment, Kopcke assumes that the after-tax rate of interest is the same for all simulations. This assumption implies that the after-tax rate of return required by marginal bondholders is invariant. But Kopcke does not specify who these marginal bondholders are. Different results would be obtained depending on whether these marginal bondholders are tax-exempt institutions, corporations, or households. Moreover, he does not take into account the fact that the proposed tax reforms will lower domestic savings, initially by shifting taxes from consumers to business, and eventually by increasing the federal deficit. Simulations of all these effects have been performed by Data Resources Inc.[1] They conclude that nominal pretax interest rates will

[1]See Data Resources, Inc., "The DRI Study of Tax Reform" (a private multiclient study), Lexington, MA: May 1985; Roger E. Brinner, Testimony to the Senate Finance Committee and the House Ways and Means Committee, June 27, 1985; and Roger E. Brinner, "Tax Reform II: The President's Tax Proposals for Fairness, Growth, and Simplicity," *U.S. Long-Term Review,* Summer 1985.

change one way or the other and, as a result, the after-tax cost of corporate debt will increase.

For the real cost of equity D, Kopcke uses the expression

$$D = Y + G \tag{1}$$

where Y is the dividend-to-price ratio for common stocks and G an estimated real rate of growth of nonfinancial enterprises. While this expression, used widely in the literature, makes good sense, it is unreasonable to assume that the yield Y and real rate of growth G will not change significantly as a result of a major change in the tax code. Although it is nearly impossible to make an accurate evaluation of the effects of the tax code upon the cost of equity, there are several plausible models that I have used which show such effects to be significant.

Kopcke reduces the corporate tax rate that appears in the denominator of his final formula for the cost of capital by a factor that depends on the fractions of corporate dividends that are tax-deductible. Such a modification is unjustifiable. Dividend deductibility does reduce the cost of capital, but only by virtue of the fact that the cost of equity is less than that indicated by equation (1). Specifically, if a fraction β of the dividends paid by a corporation can be deducted from taxable income, the after-tax cost of such dividends is reduced by the factor $(1 - \beta Z)$, where Z is the statutory marginal corporate tax rate. In this case the appropriate expression for the cost of equity is

$$D = Y(1 - \beta Z) + G \tag{2}$$

My own analysis of the effects of the four proposals on factors affecting economic growth in the long term, disregarding short-term damage, indicates the following:

1. The user cost of capital for equipment will rise by more than 10 percent.
2. The user cost of capital for structures will decline by more than 5 percent.
3. The tax code will be more neutral across different types of tangible assets and, therefore, allocation of capital will be more efficient.
4. The real discount rate, after taxes, that businesses apply to future cash flows will rise. That means that investment in new ventures such as R&D activities will either decline, focus on shorter-term payoffs, or both.

The first three effects may balance each other, but the fourth effect is so critical to the international position of our manufacturing industries that all four proposals, especially the Treasury I plan and Bradley-Gephardt, will reduce economic growth in the United States.

In his closing remarks Kopcke points out that all proposals, and in particular Treasury I, seem to be useful models upon which to build

future tax reforms. There is no question in my mind that all of the proposals examined contain ideas that are sound and useful. But a far better model than any of these is the Japanese tax system, which combines neutrality across assets, virtual elimination of double taxation, strong incentives for growth, and strong disincentives to stagnation. It is partly due to such a tax system that Japan's cost of capital is less than half that of the United States and its investment in equipment per employee and rate of productivity growth more than twice ours.[2]

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[2]George N. Hatsopoulos and Stephen H. Brooks, "The Gap in the Cost of Capital: Causes, Effects, and Remedies," in R. Landau and D.W. Jorgenson, *Technology and Economic Policy* (Ballinger: forthcoming 1986).

Discussion

*Alan J. Auerbach**

In looking at the order of discussants, I imagined that my role in evaluating Richard Kopcke's paper on investment was to steer a course between the cost-of-capital Scylla and the Charybdis of the accelerator. This is relatively easy when the mean squared error is as large as is typically found in investment equations.

This is where I begin, and it will also be where I finish. Perhaps the most important point to be emphasized, when considering fundamental changes in our tax system, is that our econometric techniques provide us with little ability to predict economic behavior when we introduce major changes in the economic conditions facing firms. It is prudent to attribute a fair amount of uncertainty to simulated responses to major tax revisions. My specific comments on the paper are intended to illustrate this point.

Kopcke simulates the effects of four popular tax reform plans on fixed investment by firms, using two familiar models of investment behavior, the cash-flow model and the neoclassical model. According to the cash-flow model, a firm's investment is determined by the level of its internally generated funds. According to the neoclassical model, the investment decision rests on changes in the level of output and in the user cost of capital, which in turn is based on financial costs, tax factors, and the rate at which capital decays. The author is a bit misleading in suggesting that "these two approaches explained the recent course of investment spending rather well." What he really means is that they do as well or better than other models. The fact is that investment in the 1980s has been rather hard to predict. This is evident if one looks at

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Kopcke's earlier paper in which he actually estimated the equations he uses here. Out-of-sample root-mean-squared errors for the 1980s are many times larger than those for the sample period of estimation, and, like those of most other forecasters, Kopcke's models underpredict the strength of recent investment.

The problem is that real, after-tax interest rates have been too high, and after-tax corporate profitability too low, to justify the investment recovery observed in 1984. Some (for example, Bosworth 1985) have suggested that what is happening is a strong shift in the demand for capital among sectors. Because of the irreversibility of investment, weak demand in one sector does not fully cancel strong demand elsewhere: you can't turn a tractor into a word processor. However, there are always sectoral shifts over time, making this explanation for the unusual recent behavior of investment less than compelling. Others (for example, Blanchard and Summers 1984) have suggested that investors have greater confidence in government and expectations of future profitability than they did a few years ago. Perhaps this reveals the true meaning of "voodoo economics" as the act of conjuring up the animal spirits first envisaged by Keynes.

Thus, Kopcke begins his analysis of proposed reforms with models carrying very limited warranties. He then must decide just how to account for different provisions not present in the current tax code. Two of the most important of these provisions are found in the two Treasury proposals, Treasury I and Treasury II, the latter perhaps more appropriately called White House I. These are the dividends-paid deduction, set at 50 percent of dividends paid under Treasury I and 10 percent of dividends paid under Treasury II, and the windfall tax on excess depreciation that would be imposed under Treasury II.

Kopcke ignores the second, following the logic that his comparisons begin in 1981, before any excess depreciation under ACRS would have occurred. This has the effect of making cash flow under Treasury II look a lot better to his investment model than it does to actual investors at the moment, who would lose $56.5 billion between now and 1989 as a result of this specific provision.

In accounting for the effect of the dividends-paid deduction on the user cost of capital, he assumes that firms will pay out half of their gross returns to capital, *before* depreciation, as dividends. This is a substantial overstatement of actual payout ratios. If one takes the more usual approach of treating dividend relief as a reduction in the effective personal tax rate on that fraction of after-tax earnings coming from new investment that is distributed as dividends, the implied changes in the cost of capital are much smaller. My back-of-the-envelope calculations suggest that Kopcke would predict percentage reductions in the user cost of capital under the Treasury I dividends-paid deduction that would, for

equipment, exceed that coming from a *doubling* of the investment tax credit. My own calculations also suggest that he has overstated the effect of these provisions by at least a factor of between three and six.

I say "at least" because Kopcke does not account at all for the view held by at least some economists (discussed in Auerbach 1983b) that dividend taxes impose an even smaller effect on the cost of capital than would be indicated by looking at payout ratios. Hence, both plans, and particularly Treasury I, will look much better to the neoclassical model than is probably appropriate.

With these points in mind, it is interesting to consider the paper's predictions that the plan most effective in encouraging the accumulation of business fixed capital would be Treasury II according to the cash-flow model and Treasury I according to the neoclassical model. I suspect that each of these results depends crucially on the way in which Kopcke has interpreted these plans, and that if different, perhaps more realistic assumptions were incorporated, Kopcke, like others, would find that it is hard to beat ACRS for total fixed investment, except perhaps with Kemp-Kasten, for which FAST is certainly an appropriate acronym in the area of depreciation allowances.

Before concluding, I must raise a strong objection to Kopcke's characterization of tax neutrality in the beginning of his paper. We can all agree that lump sum taxes are nondistortionary and that this is a complicated world, but there *is* a well-supported efficiency argument for attempting to make the tax base correspond to true economic income, if indeed an income tax is to be used at all (Auerbach 1982). This amounts to trying to make depreciation schedules resemble those dictated by economic depreciation, or at least mimic the effect of such schedules through other means. The efficiency cost of the present distortionary system of corporate taxation is probably on the order of several billion dollars a year (Auerbach 1983a). Nowadays such numbers seem small but we need all the national income we can get. Moreover, there are important additional problems associated with the rapid depreciation of assets under current law, most notably the increased incidence of tax losses and their associated distortions.

Certainly there are problems in making the transition to a less distortionary tax system. One must also worry about second-best considerations, and the fact that going from a tax system with high tax rates and investment incentives to one with low rates and low investment incentives may waste tax revenue on substantial windfalls to existing capital assets. But this does not make the goal of reduced distortions, which plays an important role in all of the proposals considered here, unimportant or simply a matter of equity. Rather, it means that we have to think a little harder about the design of appropriate transition schemes, such as a phased reduction in corporate taxes (analyzed in Auerbach and Hines

1986) that can provide better short-run investment incentives while at the same time increasing corporate tax collections.

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Discussion

*Robert Eisner**

The bottom line of Kopcke's ambitious study is that three of the four tax reform proposals he considers, Treasury I and Treasury II and Kemp-Kasten, would boost business investment. I don't believe it, but that's not all bad. Indeed, I might begin by challenging the fairly conventional wisdom that we want more business investment. Business investment does not necessarily promote growth. It can be unproductive.

The widespread notion that investment does promote growth stems, presumably, from the notion that businesses in a free market undertake investment in the (correct) expectation that its future proceeds exceed its current costs. But if those proceeds include tax subsidies, firms may be induced to acquire capital assets whose future product exclusive of tax benefits is less than their supply price or opportunity cost. That is the path of decline, not growth.

The notion that business investment under current law has been retarded by its tax treatment is not easy to sustain. The combination of deductibility of swollen nominal interest costs, exclusion of the bulk of capital gains from taxation, accelerated depreciation for tax purposes, the investment tax credit, the proliferation of tax shelters, and the exclusion of vast amounts of saving from taxes, is such that the current tax system on balance subsidizes new business fixed investment, albeit most unevenly.

And I must also inveigh against the all too easy assumption that business income taxes in general discourage business investment. The fact is that the corporate profits tax is a tax on corporate income: income from capital, from labor, or from any other factor of production. It does

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not in itself change relative factor costs and therefore does not encourage less capital-intensive production. I suppose application of the "cash-flow" model, with the assumption that corporate income taxes are in no way passed on, can bring the then definitional result, in terms of that model, that investment must fall. That is just another piece of evidence on the foolishness of the cash-flow model of investment.

I might as well state it flatly: the cash-flow model is nonsense. If it really described business behavior, our rationale for a private-profit market system would be destroyed. Businesses would be investing whether capital assets promised to be productive or profitable or not, merely because they had the money.

Indeed, curiously, the "cash flow" in cash-flow models, including Kopcke's version, does not even measure cash flow. Rather it describes gross profits minus dividend payout; and with dividends a fairly sticky variable, variations in cash flow reflect variations in gross profits. But profits need hardly be in cash and frequently are largely tied up in inventories and accounts receivable.

Kopcke does not make clear in the current paper where he gets his models' presumably estimated parameters. The usual positive associations between cash flow and investment relate essentially to the fact that both investment and profits are procyclical. That tells us nothing about the likely effects of a structural change in after-tax profits brought on by changes in tax provisions.

In Kopcke's simulations with a cash-flow model, dividend deductibility, as in Treasury I, increases cash flow—and therefore investment—because the only element of cash flow that Kopcke allows to be affected by the various tax plans is the tax payments themselves. But surely, offering 50 percent deductibility for dividend payments could be expected to encourage firms to pay out more of their earnings. If they more than double their payout, cash flow, as defined, would actually decline!

I would quarrel with Kopcke's assertion that double taxation of dividends discourages capital formation. It does indeed distort capital financing and it inhibits the free flow of potentially investable funds. To the extent that it discourages payout, however, it may well encourage firms to expand and one major way of expanding is investment. As to the notion that the double taxation of dividends significantly raises the cost of capital to the firm, this largely ignores the overwhelming role in the supply of capital of the expectation of essentially untaxed capital gains, as well as the extent to which investors with low or zero marginal tax rates are likely to be preponderant among dividend recipients.

While the cash-flow model may, to put it bluntly, be reasonably dismissed out of hand, the difficulties in the so-called neoclassical model are in part intrinsic and in part related to Kopcke's application of the model. A major difficulty is the common one of assuming parameters,

such as interest rates or costs of capital, which may appear exogenous to the firm, as independent, in the economy as a whole, of variations in tax parameters. The introduction of ACRS in 1981, according to some neoclassical model devotees, was supposed to bring about a big increase in business investment by reducing the rental price or user cost of capital. In fact, the increase in the rental cost of capital due to a sharp rise in real interest costs considerably outweighed reductions due to the more favorable tax treatment. But should not any reasonable macroeconomic model have suggested that the tax reduction, particularly one deemed to increase investment demand, would contribute to higher real interest rates?

I have some concern for the particular distributed lag formulation, going back to an article of Bischoff a number of years ago, from which Kopcke derives his parameters. Perhaps more troublesome is the use of dividend/price ratios as the variable element in the cost of capital. As I confess I have tried to point out on a number of previous occasions, the dividend/price ratio is much more properly viewed as the inverse of a measure of the expected profitability of investment than of the cost of capital. For the price of equity will be high relative to fairly sticky dividend payments precisely when expected future profits on investment are high. A negative time series relation between investment and a "cost of capital" built around the dividend/price ratio tells us nothing about any true relation with the cost of capital or the total rental price of capital of which it is a part. For the cost of capital to a firm relates not to its current dividends but to the share of expected earnings which must be anticipated for new stockholders. We can infer nothing from the relation between investment and the dividend/price ratio about the effects of changes in tax parameters that would affect the rental price of capital.

A further problem with both estimation of the neoclassical investment function and its use to predict effects of changes in tax parameters is the failure to include a price expectations or capital gains term. This term was indeed in the original neoclassical formulations but, presumably because of data difficulties, is rarely included in estimations. But it can be critical.

In fact, the effect of corporate tax rate changes on the rental price of capital is ambiguous in the neoclassical formulation. It is not necessarily true that a higher corporate tax rate will increase the rental price of capital or that a lower rate will reduce it. The business income tax rate actually enters in both the numerator and the denominator of the rental price of capital term. Changes in it depend upon an interaction with the expected rate of capital gains, the present value of tax depreciation allowances, the proportion of the cost of capital which is tax-deductible —and that may be more than 100 percent when inflation swells nominal interest rates far above real interest costs—and the amount of the invest-

ment tax credit. Without specifying all of these, we cannot infer that lowering the corporate tax rate, as all of the tax reform proposals would, actually lowers the rental price or user cost of capital.

But a major factor in Kopcke's results with the neoclassical model relates, particularly for the evaluation of Treasury I, to his treatment of dividend deductibility. For he sees in this a reduction in the marginal tax rate which enters with a negative sign in the denominator, but no change in the marginal tax rate applicable to the present value of depreciation deductions in the numerator! This stacks the deck overwhelmingly in favor of any plan with dividend deductions and makes Treasury I, with its 50 percent dividend deduction, a huge "winner."

I see no justification for this treatment. Dividends, which are only about one-third of taxable profits, not one-half as assumed by Kopcke, would not seem to have much to do with the marginal tax rate on the income from new investment. Firms undertaking new investment may hardly be expected to plan higher dividend payments as a consequence. And if they did, the reduced marginal tax rate that they anticipate should be applied to the present value of the associated added depreciation allowances which would be tied to the new investment. And I might add again that it is capital gains, and in large part untaxed, "unrealized" capital gains, which are the dominant reward to investors supplying equity capital, not dividends.

My own conclusion, based partly on my own priors and estimates of the elasticity of the demand for capital with respect to its cost, is that Treasury I, and the new House of Representatives version of tax reform, would have had little effect upon the aggregate of business investment. Either one would be beneficial in making tax treatment of investment more neutral and therefore on balance making the investment undertaken much more productive.

Treasury II was actually, under reasonable inflation assumptions, more favorable in its tax treatment to investment than even ACRS, now appropriately, if belatedly, widely maligned. Treasury presentations of implications of Treasury II's depreciation provisions had been unfortunately misleading in failing to make clear the huge benefits to taxpayers, and losses to the Treasury, resulting from the combination of inflation adjustments and the retreat from the economic depreciation of Treasury I.

Whether this or any other moves to maintain or enlarge investment "incentives" will do much for investment, I quite doubt. Their major effect would be to line the pockets of those who might otherwise pay business taxes and their owners.

But after all, is that not their real purpose?