Environmental Taxes To Finance Capital Tax Reform

Kevin Hassett
American Enterprise Institute

and

Gilbert E. Metcalf
Tufts University

Accurate Prices Program
November 2001

Redefining Progress
For People, Nature, and the Economy

www.RedefiningProgress.org

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

With *Environmental Taxes to Finance Capital Tax Reform*, Redefining Progress continues its series of papers on the economic effects of environmental tax reform (ETR). ETR involves shifting taxes in a revenue-neutral way by increasing tax revenues from environmentally damaging goods and activities and reducing revenue from more productive tax bases, such as labor or investment. Climate change action through ETR would likely have minimal economic impacts on most industries.

Authors Kevin Hassett and Gilbert Metcalf explore one tax shift scenario whereby the money raised by a carbon tax would fund "corporate tax integration," or taxing all corporate income at a single tax rate. Integration would eliminate the double taxation of corporate income paid as dividends, which under current U.S. tax law get taxed as corporate income and again as personal income. The federal government taxes dividends at rates as high as 61%, this compares to much lower rates on retained earnings (and subsequent capital gains).

Environmental Tax Reform involves shifting taxes in a revenue-neutral way by increasing tax revenues from environmentally damaging goods and activities and reducing revenue from more productive tax bases, such as labor or investment.

The study concludes that such a tax shift would have very small effects on the taxes paid by most industries. Several sectors would benefit from the tax shift by paying less in taxes, and only the most energy-intensive industries would face significant adverse effects. To the extent that the most-affected industries can pass on a carbon tax to consumers, this would mitigate the impact of the tax shift's effects on industry profits.

The authors argue that the proposed carbon-corporate tax shift makes environmental and economic sense for a number of reasons. Given the mandates of the Kyoto Protocol (which stipulates that the United States cut its carbon emissions by seven percent from 1990 levels in the years 2008-2012) a carbon tax would provide an important market incentive to help the United States meet this target. Even with the United States' recent repudiation of the treaty, it remains likely that the country will eventually need to reduce carbon emissions.

Many economists argue that reducing the tax on capital income would provide the greatest efficiency gains for the economy. In addition to lowering overall corporate tax rates, corporate tax integration would eliminate higher tax rates on paying dividends vs. retaining income, structuring a company as a corporation vs. as a partnership, and equity vs. debt financing. Further, corporate tax reduction might be a necessary carrot for business to accept the imposition of a new carbon tax and to make a tax shift politically feasible.

PROPOSALS

Hassett and Metcalf consider two different corporate tax integration plans. The first, the Shareholder Allocation Plan (SAP), would tax all corporate income, whether paid out or retained, at the individual income tax rate, just like other forms of personal income. The SAP would convert the corporate tax into a withholding allowance, with all taxes on corporate income paid by shareholders when they receive income from dividends, corporate interest, or capital gains.

The SAP would thus eliminate an important distortion in our tax system—it would no longer tax corporate income paid as dividends at a higher rate than retained corporate income.

Further, corporate income would be taxed just like personal income earned from other sources. However, it would create significant administrative complications. It also would reduce annual tax revenue by an estimated $48.4 billion (in 1996 dollars), and therefore would require $48.4 billion in carbon tax revenue to make the tax shift revenue neutral.

An alternative proposal is the Dividend Exclusion Protocol (DEP). The DEP would simply exclude dividend income from taxation at the personal level, subjecting them only to the 35% corporate income tax. Retained earnings would continue to be subject to both corporate taxation and capital gains taxation, which for individuals in the highest tax bracket would result in an effective tax rate of approximately 40%.

Because the DEP does not equate taxes on retained income and income paid as dividends, it does not achieve full corporate tax integration like the SAP. But it does greatly reduce the current difference in the tax rates between corporate income that is retained or paid as dividends. The DEP also offers a major advantage over the SAP in that it would require no new administrative costs or oversight. The authors estimate that integration using the DEP would cost $31.2 billion in lost annual tax revenue to be made up by a carbon tax, another advantage over the more expensive SAP.

FINDINGS BY INDUSTRY SECTOR

By reducing the effective tax rates on corporate income paid as dividends or interest, the SAP or DEP integration plans would especially benefit corporations with heavy dividend payouts or equity financing. Conversely, the carbon tax, while falling directly on fossil-fuel industries, would indirectly increase the tax burden of industries in proportion with their energy intensiveness.

The authors find that a large majority of industries would not have their prices changed drastically by the tax shift.

Who ends up hurting or benefiting from the tax shift also depends on to what degree consumers end up paying for (or benefiting from) changes in business taxes. Economic tax incidence theory dictates that industries will attempt to pass the carbon tax on to consumers by raising the prices of their products, but they can do this only to the extent that competition and consumer price sensitivity will allow. Similarly, corporations will attempt to retain the tax savings resulting from corporate tax integration, but competition could force firms to pass these savings on to consumers by lowering the prices of their products.

Hassett and Metcalf report two statistics for each industry to measure the expected effects of the tax shift. First, they assume that all of the increased taxes from the carbon tax and the decreased taxes from corporate tax integration get passed on to consumers through the prices of goods produced by each industry. Taking into account how energy prices would change from the tax shift, they find that prices would rise in 29 of 50 industries analyzed and would fall in the other 21 under the SAP-carbon tax shift.

Under the DEP, consumer prices in 30 industries would rise. Not surprisingly, the three industries to be hardest hit by the tax shift are petroleum products, coal mining, and utilities. These industries' prices would rise 6-12% under the SAP and 4-8.5% under the DEP. Benefiting the most from the tax shift would be finance and insurance, both high-dividend industries that are not energy intensive.

However, besides the three industries most hurt by the carbon tax, the authors find that a large majority of industries would not have their prices changed drastically by the tax shift. Forty-seven of 50 industries would see their prices change from -1.84 to 1.21% under the SAP and between –1 and +1% under DEP, suggesting that the tax shift would have moderate effects on most industries.

The authors then consider the possibility that shareholders, and not consumers, would receive the benefits of corporate tax integration, which is a common economic assumption. They calculate a statistic called the "Breakeven Incidence Share" (BIS) for each industry. The

BIS represents the percent of the carbon tax that must ultimately fall on shareholders for the price increase from the carbon tax to just offset the price decrease from tax integration. This measure assumes that shareholders receive the full benefits of integration. A lower industry BIS means the industry is more likely to be hurt by the tax shift, since it must pass on more of the increased costs of the carbon tax to break even.

The authors find that a large majority of industries have a BIS measure of greater than 40%, depending on which corporate integration plan was adopted. This means that almost all industries would come out ahead from the tax shift, as long as they passed on at least 60% of the increased costs of the carbon tax to consumers. The industries most hit by the tax shift (petroleum, coal mining, and utilities) have BIS measures in the 5-12% range. This means that these industries would likely face increased costs from the tax shift unless they passed 90-95% of the carbon tax onto consumers. Forty percent of the businesses analyzed would come out ahead even if they had to completely absorb the increased costs of the carbon tax.

Hassett and Metcalf present evidence that the United States can introduce a carbon tax in its efforts to slow emissions that lead to climate change with small impacts on most industries.

The authors suggest that one way to soften the impact on those industries most affected by the carbon tax is to exclude 100% of these industries' dividends from taxation while only exempting 50% of dividends from other industries.

IMPLICATIONS

Hassett and Metcalf present evidence that the United States can introduce a carbon tax in its efforts to slow emissions that lead to climate change with small impacts on most industries. Corporate tax integration offers two key advantages over other types of tax cuts in ETR: expected large efficiency gains and an enticement for business to back climate change action.

However, the carbon/corporate integration tax shift plan comes with two important caveats. While the authors show how the overall effects on industry may be moderate, the tax shift is likely to fall regressively on consumers. A carbon tax would likely cause sharp energy price increases, which would affect low-income communities disproportionately. Unlike other ETR proposals that would cut income or payroll taxes, corporate tax integration would likely provide offsetting relief for higher energy prices to shareholders than to lower-income people.

Further, it is unclear that the levels of the carbon tax needed to balance the revenue losses from corporate tax integration would be sufficient to make a serious impact on the United States' carbon emissions, and therefore on our ability to meet the obligations of the Kyoto Protocol.

However, to the extent that business needs to be convinced that the country could introduce a carbon tax without strongly negative economic effects, corporate tax integration offers a potentially effective option for a politically feasible tax shift.

INTRODUCTION

Environmental tax reform is of interest to both academic researchers and policymakers. The Kyoto Protocol has focused policymakers on the need for substantial initiatives to reduce carbon emissions in the United States. Academics have responded with a variety of studies to see how taxes could be used to meet U.S. obligations under Kyoto. For example, Weyant and Hill (1999) describe a number of studies and models that evaluate taxes required to achieve Kyoto-mandated cutbacks.

Distributional concerns have long impeded progress on green tax reform. Some recent work, however, suggests that these concerns may be overstated. Previous work by Metcalf (1999) suggests that a distributionally neutral environmental tax reform would be easy to construct. Bovenberg and Goulder (2000) have pointed out that grandfathering existing carbon emissions may overcompensate industry; hence substantial revenue can be raised with a carbon tax without necessarily causing significant losses to industry.

While this paper is couched in terms of a carbon tax, an entirely equivalent policy would be a tradable permit scheme with permits initially sold by the government. The market clearing price for a given number of permits will be the same as the tax set by the government and the amount of carbon emissions in both the tax and permit systems would be the same. Note that sale of the permits is required to obtain the equivalence between a tradable permit and tax system. If the permits are given out (as was done under the SO_2 permit scheme in the Clean Air Act Amendments of 1990), then the funds necessary to pay for corporate tax integration will not be available.[1]

This paper continues a long-standing interest by Redefining Progress (RP) in environmental tax shifting that began with Hamond et al. (1997). More particularly, this project is part of a research agenda on the impact of environmental tax reform on businesses. Previous work funded by RP includes Gale and Hassett (2000) and Wolff (2000). In this paper, we consider the impacts on industry of implementing a carbon tax to pay for partial corporate tax integration.

---

1 To ensure comparability between a tax and permit system, the purchase of permits should be tax deductible to the same extent as an emissions tax would be. Moreover, if permit purchases are tax deductible, then permit sales should be treated as taxable income. One difference between a permit and tax scheme is that the goverment cannot entirely ensure a permit trading price (even under perfect certainty). For example, environmental groups could purchase permits and retire them—thereby effectively reducing the emissions quota and driving up permit prices. It is unlikely, however, that private purchases would be great enough to have a significant impact on permit clearing prices.

BACKGROUND

The idea of a carbon tax combined with a reduction in existing taxes has been extensively studied. See, for example, Bovenberg and Goulder (1996) who consider cuts in the personal income tax financed by a carbon tax. The focus on a carbon tax is a natural one given the need to cut carbon emissions in the United States by 7 percent from 1990 levels in the years 2008-2012 (as mandated in the Kyoto Protocol).[2] Emissions of carbon dioxide (CO_2) in 1990 totaled 1,347 million metric tons of carbon, increasing to 1,495 million metric tons in 1998, according to the most recent report on greenhouse gas emissions from the Energy Information Administration (1999). While CO_2 emissions per dollar of GDP tended to fall in the 1990s, they are 11 percent above 1990 levels and 19 percent above the target for emissions set in the Protocol.

Thus, a substantial effort will be required to meet the target. A carbon tax is an obvious policy tool to help achieve the goals set forth in the target. A natural question is what to do with the carbon tax revenue. Research by a number of economists has indicated that reducing the tax on capital income financed by environmental tax revenues would provide the greatest efficiency gains relative to other uses of the tax revenue. Corporate tax integration is a way to reduce the tax on capital income.

Corporate tax integration is an effort to subject all income to uniform treatment under the income tax. The United States, like many countries, has a personal income tax and a corporate income tax and treats these two taxes as separate and distinct. Thus, income earned in the corporate sector can be subject to a tax first through the corporate income tax and then through the personal income tax. Such a system leads to a number of tax-induced behaviors that can have significant efficiency impacts:

- Payout Behavior: The corporate income tax affects the decision to pay out after-tax profits in the form of dividends or to retain earnings within the corporation.

- Financing Behavior: The corporate income tax influences the decision to finance new investments with equity or debt.

- Corporate Organization: The corporate income tax affects the decision to organize businesses as corporations or partnerships.

Table 1 illustrates these distortions. It shows the amount of tax paid on a dollar of earnings from an investment for different financing, organizational, and payout assumptions.

Corporate tax integration is an effort to subject all income to uniform treatment under the income tax.

TABLE 1

TAX RATES ON MARGINAL PROFITS

	General Tax Rate	Current Tax Rate
Corporate Dividends	$t_c + (1-t_c)t_p$	61.0%
Corporate Interest	t_p	40.0%
Corporate Retained Earnings	$t_c + (1-t_c)t_g$	39.6%
Non-Corporate Payouts	t_p	40.0%

[2] The Kyoto Protocol actually mandates reductions in six "greenhouse gases": carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Carbon dioxide is by far the most significant of the six gases and we limit discussion to this gas. The text of the Kyoto Protocol along with explanatory documents can be found at http://www.unfccc.de.

[3] This simplifies the analysis somewhat as we ignore various complicating factors including the alternative minimum tax, as well as the tax treatment of foreigners and tax exempt organizations. The accrual equivalent tax rate on capital gains accounts for the fact that capital gains are only taxed upon realization. Moreover, basis step-up at death further reduces the effective tax on capital gains.

The second column gives the general formula for the total amount of taxes paid on a dollar of pre-tax profits. There are three relevant tax rates: the corporate rate (t_c), the personal tax rate on dividends or interest income (t_p), and the accrual equivalent tax rate on capital gains (t_g).[3] To give a sense of the differences in taxation, we provide numerical results using a tax rate of 35 percent for the corporate tax, 40 percent for the personal tax, and 7 percent for capital gains.

The table illustrates the various distortions. First, there is a bias against paying out dividends. Profits paid out as dividends are taxed at a rate of 61 percent while retained earnings (leading to capital gains) are only taxed at 39.6 percent. Second, there is a bias against equity financing: a dollar of profits paid out in dividends incurs roughly 1 1/2 times the level of taxes on income paid out as interest. Third, there is a bias against the corporate organizational form. Corporate profits are taxed more heavily than non-corporate profits.[4]

The Shareholder Allocation Plan (SAP) approach retains a corporate income tax but passes all corporate income, taxes, and credits through to shareholders. In effect, the corporate income tax serves as a withholding tax.

An extensive literature exists on the efficiency losses due to the double taxation of corporate income. A 1992 Treasury study on tax integration estimated annual efficiency gains from integration ranging from $2.5 to $25 billion (in 1991 dollars).

According to McLure (1979), interest in integrating the corporate and personal income tax systems increased in the 1960s and early 1970s for three reasons. First, there was widespread concern about the low rate of capital formation and it was thought that reducing the taxation of dividend income might encourage increased investment. Second, a number of European countries provided some form of dividend tax relief. Finally, a Canadian Royal Commission on Taxation report in 1967 argued that complete integration might in fact be feasible and not simply an impractical idea.

Interest in tax integration was overshadowed in the 1980s by broad-based income tax reform that culminated in the Tax Reform Act of 1986 (TRA86). Rather than fundamentally changing the tax system, TRA86 engaged in base broadening and rate lowering, reducing the top marginal tax rate on personal income from 50 to 28 percent and the top corporate tax rate from 46 to 34 percent. Moreover, as federal budget deficits grew dramatically in the 1980s, there was little interest in any tax reform that would likely lead to lower tax collections. More recently, discussion has focused on replacing the income tax with a consumption tax. It is unlikely, however, that any progress will be made towards such an extensive reform.

One of the objections to tax integration is its cost. The impetus behind this analysis is that the cost of tax integration can be paid for by revenues from a carbon tax. Such a "green tax reform" would be desirable on both environmental and efficiency grounds. Let us next turn to the mechanics of tax integration. We'll look at two proposals in particular.[5] First, we'll consider full integration where corporate income is allocated to individual shareholders and subject to tax at the personal level. Second, we'll consider dividend tax exclusion at the personal level.[6]

1. SHAREHOLDER ALLOCATION PLAN

The Shareholder Allocation Plan (SAP) comes close to a "passthrough" (complete) integration plan that achieves all the goals of a textbook integration of the two income taxes. The SAP approach retains a corporate income tax but passes all corporate income, taxes, and credits through to shareholders. In effect, the corporate income tax serves as a withholding tax.

The first important characteristic of the SAP is that dividend income is not taxable at the personal level (since the goal of the SAP is to tax corporate income, not corporate

[4] With these numbers, the bias goes away if all corporate after-tax profits are retained.

[5] This section draws in part on an excellent analysis of tax integration written by the U.S. Department of the Treasury (1992) (also summarized in Hubbard (1993)).

[6] McLure (1979) argues against this scheme and proposes instead a dividend deduction at the corporate level (similar to the interest deduction). The advantage of McLure's approach is that corporate income is taxed at the shareholder's tax rate rather than the corporate tax rate. It also eliminates the distortion between debt and equity financing (if basis adjustment for dividends paid is made). The 1992 Treasury report considered but rejected this approach on the grounds of cost and implementability.

distributions). To see how the SAP works, consider the following simple example. A corporation has $100 of taxable income per share, pays $35 in corporate taxes, and has $65 in after-tax profits that it can either distribute to shareholders (as a dividend) or keep as retained earnings. The purpose of the SAP is to tax the shareholder on the $100 of taxable income at the shareholder's tax rate rather than to tax income distributed as dividends or retained (and thus leading to capital gains). Let's assume for the moment that the entire $65 of after-tax profits is paid out as a dividend. Rather than taxing dividend income, the SAP subjects the entire $100 of corporate income to taxation at the personal level. Just as a worker receives a W-2 form from an employer detailing wages paid and taxes withheld, a shareholder would receive a "corporate W-2" detailing income earned and taxes withheld. In this example, the shareholder would report $100 of taxable income on his personal income tax and receive a tax credit for the $35 of taxes paid at the corporate level. For a taxpayer in the 40 percent personal income tax bracket, the gross tax liability on the corporate income is $40 and the net tax liability (net of corporate tax payments) is $5. The shareholder has $60 in after-tax income available for consumption or saving—the $65 dividend less the $5 personal tax liability. His corporate income has been subjected to a 40% tax.

Next, assume that the corporation retains the entire $65 in after-tax profits. Under the assumption that equity markets are efficient, the retention of $65 should increase share value by $65. Assuming efficient markets, the shareholder's income has gone up by $65 (the increase in value of the shares). As in the case of distributed profits, the shareholder pays a tax on the $100 of corporate income and receives a tax credit for the $35 in taxes paid at the corporate level. In addition, the cost basis for the stock is increased by the amount of retained earnings so that no tax liability will be incurred on the capital gains due to these retained earnings.

To see how this works, imagine that the shareholder bought one share of stock in this corporation on Monday for $1,000. On Tuesday, the corporation earns $100 per share, pays taxes of $35 per share, and retains $65. In an efficient market, the value of the stock will increase from $1,000 to $1,065. On Wednesday, the shareholder sells his share for $1,065. His selling price for purposes of calculating taxable capital gains is $1,065. His cost basis, however, is increased from $1,000 to $1,065 since $65 has been added to retained earnings. Thus, the taxable capital gain is $1,065 – 1,065 = $0. The shareholder has received $65 in capital gains upon sale, is subject to a net personal income tax liability of $5 (as in the dividend case above) and so has $60 in after-tax income. The corporate income again has been subjected to a tax of 40 percent.[7]

Table 2 shows the marginal tax on a dollar of profits under the SAP. It shows that the various distortions discussed above are eliminated under the SAP.

TABLE 2

TAX RATES ON MARGINAL PROFITS UNDER SHAREHOLDER ALLOCATION PLAN (SAP)

	General Tax Rate	Current Tax Rate
Corporate Dividends	t_p	40.0%
Corporate Interest	t_p	40.0%
Corporate Retained Earnings	t_p	40.0%
Non-Corporate Payouts	t_p	40.0%

The shareholder allocation plan is considerably more complicated to administer than the dividend exclusion plan discussed below. Reporting and auditing burdens for corporations are likely to be significant. For example, the Treasury plan would not pass through corporate losses to shareholders but rather carry them forward at the corporate level. This is in keeping with general tax policy. In addition, change of stock ownership during a year complicates allocation of income and taxes to individuals. Since taxable income and tax liabilities are only

[7] A simpler approach would be to simply eliminate the tax on capital gains at the personal level. There are a number of problems with this approach. For example, imagine that Bill Gates suddenly announces a special licensing arrangement with Apple Computer and, as a result, the value of Apple Computer stock increases by 15 percent. These capital gains are income that will not be subject to tax at the corporate or personal level if capital gains are no longer taxed at the personal level. Thus, the basis adjustment described in the text is a preferable method of handling retained earnings under the SAP.

measured once during the year, allocating income and share basis to shareholders must be done on a retrospective basis (and could in fact require taxpayers to file amended returns).

The 1992 Treasury study estimated that a fully phased in SAP would cost $36.8 billion annually at 1991 income levels. This estimate has three major components. First, corporate income is taxed at the top personal tax rate rather than the corporate tax rate. Before any other adjustments, this costs $33 billion in lost tax revenue. Second, the change in basis reduces taxes of capital gains due to retained earnings. We estimate roughly $11.2 billion in lost tax revenue as a result of this change. Finally, tax integration is likely to lead to a shift from debt to equity finance as the tax disincentive towards equity finance is reduced. An economic analysis in the 1992 Treasury report estimates that corporate leverage falls somewhere between 1 and 7% when there is lump sum replacement of the lost tax revenues. The shift from debt to equity finance reduces interest deductions on the corporate income tax and so raises revenue to offset some of the loss on the personal tax side. We estimate this raises about $7.4 billion in taxes. Combining these three components yields the $36.8 billion 1991 revenue loss. Applying this methodology to 1996 data, we obtain a rough estimate of the annual revenue loss from adoption of the SAP of $48.4 billion at 1996 income levels.

The complexity of the SAP as well as the considerable revenue loss entailed suggests that a more modest and simple integration approach might be more appropriate. Thus, we next consider the dividend exclusion approach.

The Dividend Exclusion Plan (DEP) excludes dividend income from taxation at the personal level. Corporate profits paid out in dividends are only subject to the corporate income tax. The major advantage of the DEP is its simplicity and ease of implementation.

TABLE 3

TAX RATES ON MARGINAL PROFITS UNDER DIVIDEND EXCLUSION PROTOTYPE (DEP)

	General Tax Rate	Current Tax Rate
Corporate Dividends	t_c	35.0%
Corporate Interest	t_p	40.0%
Corporate Retained Earnings	$t_c + (1-t_c)t_g$	39.6%
Non-Corporate Payouts	t_p	40.0%

2. DIVIDEND EXCLUSION PROTOTYPE

The Dividend Exclusion Prototype (DEP) is a simpler form of corporate tax integration that achieves partial integration of the two income taxes. Specifically, it excludes dividend income from taxation at the personal level. Thus, corporate profits paid out in dividends are only subject to the corporate income tax. The major advantage of the DEP is its simplicity and ease of implementation. Its simplicity led the Department of the Treasury to prefer this approach to any form of dividend imputation credit scheme (U.S. Department of the Treasury (1992)).

Table 3 shows the marginal tax on a dollar of profits under the DEP. This approach does not achieve complete tax integration but reduces the bias against equity finance (relative to debt finance). It also reduces but does not eliminate the bias against corporate organization.

Let us now turn to an estimate of the revenue loss under the DEP. Net corporate dividend payments totaled $297.7 billion in 1996 in the National Income and Product Accounts (NIPA). The U.S. Treasury reported $104.3 billion of dividends in adjusted gross income (AGI) for 1996, an amount equal to 35% of net corporate dividend payments. *Table 4 (on the next page)*, drawn from data in Park (2000) provides a reconciliation of these two numbers.

According to Flow of Funds data, the household sector (excluding non-profits) along with mutual funds held roughly 55% of corporate equities in 1996. Thus, the first adjustment is to subtract out dividends paid to life insurance companies and pension plans ($45.5 billion). In addition, dividends are paid to nonprofits and to fiduciaries (not distributed to individuals). Finally, dividends on stocks held in voluntary tax-deferred savings accounts (e.g. 401(k) plans) are excluded. Taxable dividends are increased by recategorizing some dividend payments deemed interest under NIPA. All told, these adjustments reduce dividends to $149.7 billion leaving a discrepancy of $45.4 billion between NIPA estimates of dividends in AGI and IRS amounts. This discrepancy can likely

TABLE 4

RECONCILIATION OF NIPA AND IRS DIVIDEND DATA

Category	Amount (billions)
NIPA Dividends	$297.4
Less dividends received by:	
life insurance carriers and pension plans	*45.5*
nonprofits or fiduciaries	*20.8*
other exempt entities	*103.5*
Plus:	
dividends categorized as interest in NIPA accounts	*38.4*
BEA-derived dividends in AGI	*149.7*
IRS dividends in AGI	*104.3*
Unexplained difference	45.4

SOURCE: PARK (2000), TABLE 1.

be explained by differences among equity owners in their holdings of stocks. If individuals tend to hold disproportionate amounts of non-dividend paying stocks (relative to private pension funds and insurance companies), then the low amount of dividends in AGI can be reconciled with the corporate dividend payment aggregates calculated by BEA.

As a rough guide to the revenue cost of excluding dividends from taxable income in the personal income tax, we can use an estimate of the average marginal income tax rate on dividend income constructed from the NBER's TAXSIM tax calculator (Feenberg (2000)). This average tax rate in 1996 was 28.9%. Excluding dividends from taxable income would lead to a revenue loss of $30.1 billion (=.289x$104.3 billion) for that year. A few adjustments to this calculation are required to obtain a more accurate measure. First, as noted above, tax integration is likely to lead to a shift from debt to equity finance as the tax disadvantage towards equity finance is reduced. Second, there are a number of smaller changes including a reallocation of physical capital from the household, noncorporate and state/local government sectors to the corporate sector, as well as changes in the equilibrium interest rate and dividend payout rates. Taking these considerations into account, we estimate that the revenue loss falls to $31.2 billion per year.

We will consider the following two DEP proposals:

1. **Exclusion of all dividends from personal income tax financed by a carbon tax. Based on the calculation above, this would require a carbon tax of $31.2 billion per year.**

It is worth pausing to consider which industries benefit the most from tax integration. There are no data available on distribution of corporate equity holdings by industry across equity owners. We will assume that households hold equities by industry in proportion to dividend payouts by industry. *Table 5* shows the top 10 industries in terms of net corporate dividend payments. These ten industries account for over half of dividend payments in 1996 and are likely to be the greatest beneficiaries of tax integration.

Conversely, we can identify those industries that are affected most heavily by a carbon tax. Given the significant impact on these industries, we consider a second policy option:

2. **Exclusion of 100% of dividends from personal income tax from industries most heavily affected by a carbon tax combined with 50 percent exclusion for all other industries.**

TABLE 5

TOP 10 CORPORATE DIVIDEND PAYING INDUSTRIES

INDUSTRY	$BILLIONS
Finance	28.6
Communications, except radio and TV	20.9
Utilities	19.0
Retail trade	16.9
Chemicals and other products	16.3
Wholesale trade	15.4
Food and kindred products	14.8
Insurance	13.9
Business services	10.3
Real estate	8.4

SOURCE: NIPA DATA

MODELING APPROACH AND ANALYSIS

A number of economists have studied the economic consequences arising from corporate tax integration. The most common approach is to use a computable general equilibrium (CGE) model. Such models have been used by Ballard et al. (1985), Fullerton et al. (1981), and the U.S. Department of the Treasury (1992) to analyze the impact of corporate tax integration. CGE models are typically large, complex structural models of an economy derived from fundamental economic theory. Their strengths are their logical consistency, as well as their usefulness for policy and counterfactual analysis. Their very complexity, however, makes them difficult to evaluate from the outside, and deeply embedded assumptions and modeling approaches often play an important role in driving results in ways that are not obvious to the casual observer.

Rather than employ a CGE model, we undertake an analysis that uses behavioral response estimates from CGE modeling and other empirical analyses. We focus on three major changes: shifts in the allocation of capital, changes in the sources of funding for capital projects, and changes in uses of funds from capital projects.

The first critical behavioral response arising from corporate tax integration is a shift in the allocation of capital. Integrating the corporate and personal income tax will reduce the effective tax rate on corporate capital. This in turn leads to a shift in capital from the non-corporate to the corporate sector. In particular, capital flows from the household, government, and noncorporate sector to the corporate sector. This will lead to an increase in corporate taxes and a decrease in personal taxes as taxable profits shift from the noncorporate sector (as well as the nontaxable sectors) to the corporate sector.

The second critical behavioral response is a change in corporate leverage structure. Corporate tax integration removes (or reduces) the advantage to debt financing (relative to equity financing). Thus, we expect less debt financing and more equity financing. We calculate the change based on empirical estimates of the impact of taxes on financing structure from Graham (1999). Shifts from debt to equity financing affect tax collections in three ways: 1) they reduce corporate interest deductions and so increase corporate tax collections; 2) they reduce interest income taxable at the personal level; and 3), they increase retained earnings (to the extent that equity related profits are retained rather than distributed). These retained earnings will be taxed at the personal level upon realization of the capital gains associated with the earnings.

The third critical behavioral response is a change in dividend payout behavior. Changes in dividend payout behavior will have little impact on the revenue estimates. After tax integration effectively eliminates taxation of dividends, payout behavior only affects tax collections to the extent that capital gains are taxed. As discussed below, on an accrual basis, capital gains are taxed quite lightly and so changes in their tax treatment have only a minimal impact on tax collections.

SHAREHOLDER ALLOCATION PROTOTYPE

We begin with an analysis of the Shareholder Allocation Prototype (SAP). As noted above, the SAP treats corporate income in a similar fashion to partnership income. The corporate income tax continues to operate in its present fashion but should now be properly viewed as a withholding tax. Corporate income and corporate tax payments are attributed to individual shareholders who report the income on the personal income tax and take credits for any taxes paid at the corporate level.

We first note the assumptions that we make about the three types of behavioral changes we expect after tax reform. First, there is the shift in capital from the non-corporate to the corporate sector. Based on the analysis in the Treasury study, we assume a shift in capital (as a fraction of total capital) towards the corporate sector of 2.8 percentage points. As *Table 6* demonstrates, this implies an increase in corporate capital of 10.2 percent.

TABLE 6

DISTRIBUTION OF CAPITAL STOCK

Sector	Capital Stock 1996 levels	Share of Total Capital Stock	Shift in Total Capital Stock	Percentage Change in Capital Stock
Corporate	6,494	27.4%	2.80%	10.2%
Noncorporate	2,033	8.6%	-0.30%	-3.5%
Government	4,725	19.9%	-0.10%	-0.5%
Household	10,454	44.1%	-2.40%	-5.4%
Total	23,706	100%		

SOURCE: Herman (2000) and authors' calculations

What impact this shift will have on taxable income in the corporate sector is unclear. One thought might be that taxable profits will increase at the same rate as does the capital stock (assuming constant returns to scale in production and a scaling up of all other inputs in production at the same rate as capital). This overstates the growth in taxable profits for two reasons. First, a change in relative prices (decrease in cost of capital) will lead to an increase in the use of the favored factor greater than any increase in other factors. On this basis alone, the growth in output would be likely to be on the order of 1/4 to 1/3 the growth in capital. Second, this view ignores the impact of the decline in the housing sector on production in the economy. Demand for durable goods, construction, and other industry outputs would fall as capital shifts out of residential housing. We take these two considerations into account as follows: First, we report detailed industry impacts assuming no change in corporate output. Then, we show how the aggregate revenue estimates are affected by increases in corporate output. The distribution across sectors of price changes is not appreciably affected by changes in output and so our understanding of the relative industry impacts is not affected.

The second behavioral response is a change in the source of funds for corporate investment. To calculate this change, we use results from Graham (1999). Graham regresses the debt to value ratio on a number of variables including the personal tax preference for equity, $P = t_p-(1-t_c)t_e$, where t_p is the tax rate on dividend and interest income, t_c is the corporate tax rate and t_e is the tax rate on equity. The estimated change in the debt to value ratio will be $b(P_1-P_0)$ where b is the estimated coefficient on the personal tax preference for equity variable in Graham's regression, and (P_1-P_0) is the change in the value of this variable following tax integration.

The tax rate on equity is a weighted average of the tax rate on dividend income and the accrual equivalent tax rate on capital gains (weighted by the dividend payout ratio). Following Graham (1999), Gordon and Mackie-Mason (1990), and Feldstein et al. (1983), we reduce the statutory rate on capital gains by 75 percent to convert to an accrual equivalent. This is a conventional assumption based on half the taxes being foregone through deferral and half again from basis step-up at death. Given a top tax rate on capital gains of 28 percent, the accrual equivalent tax rate on capital gains is 7 percent. The pre-tax reform tax on equity equals (.59)(.289) + (.41)(.07) = .199 where the dividend payout ratio for 1996 was 59% and the average marginal tax on dividends is 28.9 percent. Thus the tax preference variable (P_0) equals .396 - (1-.35)(.199) or .267. The Shareholder Allocation Prototype drives the tax preference variable to zero (P_1 = 0). Based on Graham's preferred regression and coefficient estimate of -0.219, this reduces the leverage ratio by 5.8 percentage points.

Finally, we assume a 4.3 percent increase in the dividend payout ratio. It turns out that this parameter has little impact on the results. Since dividends are no longer taxed at the personal level and the accrual equivalent tax rate on capital gains is only 7 percent, the change in tax collections is minor relative to other changes.

We begin by reporting summary results on aggregate changes in taxation resulting from the SAP in *Table 7*.

The row labeled "Rest of the world" represents tax revenues on earnings from foreign corporations owned by domestic taxpayers. The SAP loses $8.8 billion in personal income taxes that do not benefit owners of domestic firms. See *Appendix Table A1* for a detailed breakdown of the revenue losses.

TABLE 7

SAP REVENUE LOSSES ($BILLIONS)

	Change in Corporate Tax	Personal Tax	Total
Domestic	11.5	-47.4	-35.9
Rest of the world	0.0	-8.8	-8.8
Total	11.5	-56.2	-44.7
SOURCE: Authors' calculations			

We next turn to the analysis of carbon taxes and the overall impact of the tax reform on industry prices. To finance corporate tax integration, we impose a carbon tax designed to raise $44.7 billion in 1996. As noted above, carbon emissions totaled 1,460.5 million metric tons of carbon in 1996 (Energy Information Administration (1999)). Assuming no change in emissions, a carbon tax of $30.61 per metric ton of carbon would be necessary to raise $44.7 billion. Carbon emissions break down is included in *Table 8.*

TABLE 8

CARBON EMISSIONS IN 1996

Fuel Source	Emissions (mmtc)	Fraction of Total	Revenue ($bill)
Coal	521.8	35.7%	$15.96
Natural gas	320.0	21.9%	$9.79
Petroleum	618.7	42.4%	$18.95
Total	1,460.5	100%	$44.70

We now have all the information needed to determine the direct impact of the tax reform. All we need to do is offset the tax reductions in *Appendix Table A1* with tax increases of $15.96 billion for the coal mining industry and $28.74 billion for the oil and gas extraction industries. This approach, however, ignores the indirect impacts of the taxes as prices change in the economy. We turn to that analysis now.

The conventional view of the incidence of carbon taxes is that they will be passed forward in the form of higher product prices to consumers. The input-output analysis makes that assumption and translates the intermediate goods taxes into higher industry prices as energy intensive inputs (now more expensive) are used in the production of downstream goods. Corporate tax integration, by reducing the double taxation of capital income, should increase the income of owners of all capital (corporate and non-corporate). This result was first shown by Harberger (1962) and this incidence assumption is frequently used (see, for example, Pechman (1985)). It is possible that in the context of a package reform where corporate tax integration is combined with a carbon tax, the entire package of taxes is passed forward in changes in prices of industry products. This follows as the higher prices of goods (due to the carbon tax) put domestic goods at a competitive disadvantage relative to imported goods. This competitive force makes it difficult for owners of capital to appropriate the gains from corporate tax reductions.

If this argument is correct, then the price changes we report below can be viewed as a measure of the industry incidence impact of the tax reform. Alternatively, it may be that the conventional story continues to hold and that the carbon tax is passed forward into higher prices while the corporate tax integration tax reductions accrue to owners of capital (are passed backward). Rather than attempt to determine the ultimate incidence of this complex reform, we take a different tack. We report a statistic that we call the Breakeven Incidence Share (BIS). The BIS represents what fraction of the carbon tax incidence must fall on shareholders to offset the gains from corporate tax integration (assuming all benefits from integration accrue to shareholders). For example, if an industry experiences a price increase of 4 percent due to the carbon tax and the equivalent of a 0.4 percent decrease due to corporate tax integration, then the BIS is 10 percent. In other words, so long as no more than 10 percent of the carbon tax is shifted back to capital owners and the full benefits of corporate tax integration accrue to shareholders, the benefits of tax integration exceed the costs of the carbon tax from the perspective of capital owners. A lower BIS therefore indicates a greater need for an industry to pass the carbon tax on to consumers in order to break even from the tax shift.

The Breakeven Incidence Share (BIS) represents what fraction of the carbon tax incidence must fall on shareholders to offset the gains from corporate tax integration (assuming all benefits from integration accrue to shareholders).

First, we show the price impacts resulting from corporate tax integration. As noted above, these are the price impacts under the assumption that the tax reductions are passed forward to consumers. We are not arguing that this in fact will happen; this allows us to present the tax changes in a way that allows comparison with the carbon tax price changes.

TABLE 9
PRICE CHANGES DUE TO SAP

INDUSTRY	PRICE CHANGE
Greatest Declines in Price Due to SAP	
Finance	-1.98%
Insurance	-1.61%
Communications, except radio and TV	-1.14%
Other transportation equipment	-0.99%
Chemicals & other products	-0.88%
Smallest Declines in Price Due to SAP	
Radio and TV broadcasting	0.55%
Government & other	-0.04%
Tobacco products	-0.12%
Real estate	-0.16%
Automotive repair and services	-0.16%

Not surprisingly, four of the five industries with the greatest price declines are included in the list of top corporate dividend paying industries (*Table 5*). The dispersion of price changes is moderate and in all cases negative except for radio and TV broadcasting. This sector pays little in dividends and so gains little on the personal income tax side from the elimination of dividend taxation. The small gains on the personal side are more than offset by losses on the corporate side. The price changes arising from the SAP are of a comparable magnitude to the dispersion of price changes due to the carbon tax (except for three industries) as the next table shows:

TABLE 10
PRICE CHANGES DUE TO CARBON TAX

INDUSTRY	PRICE CHANGE
Greatest Increases in Price Due to Carbon Tax	
Petroleum refining and related products	12.76%
Coal mining	10.35%
Utilities	7.19%
Primary metal industries	1.62%
Nonmetallic minerals mining	1.25%
Smallest Increases in Price Due to Carbon Tax	
Insurance	0.10%
Real estate	0.11%
Business services	0.13%
Finance	0.14%
Communications, except radio and TV	0.16%

Petroleum refining, coal mining, and utilities suffer very large price increases relative to other industries (and relative to the price decreases from SAP). Combining the two price changes, we can see that the rankings are largely driven by the carbon tax increases:

TABLE 11
TOTAL CHANGES IN PRICES DUE TO TAX REFORM

INDUSTRY	PRICE CHANGE
Greatest Increases in Price	
Petroleum refining and related products	11.94%
Coal mining	9.87%
Utilities	6.41%
Primary metal industries	1.21%
Metallic ores mining	0.90%

(continued on next page)

TABLE 11 (CONTINUED)
TOTAL CHANGES IN PRICES DUE TO TAX REFORM

Greatest Decreases in Price	
INDUSTRY	**PRICE CHANGE**
Finance	-1.84%
Insurance	-1.51%
Communications, except radio and TV	-0.98%
Other transportation equipment	-0.58%
Pipelines, freight forwarders, and related services	-0.39%

Complete results for all sectors are presented in the appendix. Of the 50 industries analyzed, 29 have a positive net price change while 21 have a negative price change. Once we get past the three industries most affected by the carbon tax, the price changes range from -1.84 to 1.21 percent, a relatively moderate range.

Comparing these two price changes is only appropriate if the reduction in capital income taxation is passed forward to consumers in the form of lower prices (or if the carbon tax is passed back to capital owners in the form of lower returns). We next report our measure of the required amount of pass-back in the carbon tax possible before equity holders are adversely affected by this reform. We report it for the ten industries with the highest net price increase.

So long as less than 6.4 percent of the carbon tax is passed back to equity holders in the petroleum refining and related products industry, returns to shareholders will not fall following this green tax reform[8]. A negative measure of the BIS means that equity returns fall even with zero pass back of the carbon tax. Among these ten industries, coal mining has the lowest BIS measure (4.6%) and nonmetallic minerals mining has the highest (46.4%). Table 12 also shows the impact on consumer prices if the benefits of the SAP are passed forward (along with the carbon tax) to consumers. The column labeled "Sum" provides the consumer price increases under full forward passing of both taxes.

Another way to present the information in the BIS is to report which industries are harmed under various amounts of backward shifting of the carbon tax. *Table 13* outlines these results.

TABLE 13
INDUSTRIES ADVERSELY IMPACTED BY VARIOUS DEGREES OF CARBON TAX BACKWARD SHIFTING

10 percent shift
Radio and TV broadcasting, coal mining, petroleum refining and related products

20 percent shift
Radio and TV broadcasting, coal mining, petroleum refining and related products, utilities, government & other, metallic ores mining

30 percent shift
Radio and TV broadcasting, coal mining, petroleum refining and related products, utilities, government & other, metallic ores mining, primary metal industries

40 percent shift
Radio and TV broadcasting, coal mining, petroleum refining and related products, utilities, government & other, metallic ores mining, primary metal industries, air transportation

50 percent shift
Radio and TV broadcasting, coal mining, petroleum refining and related products, utilities, government & other, metallic ores mining, primary metal industries, air transportation, motor freight transportation and warehousing, stone, clay and glass, nonmetallic minerals mining

TABLE 12
BREAKEVEN INCIDENCE SHARES

Industry	Carbon Tax	SAP	Sum	BIS
Petroleum refining and related products	12.76%	-0.82%	11.94%	6.4%
Coal mining	10.35%	-0.48%	9.87%	4.6%
Utilities	7.19%	-0.78%	6.41%	10.8%
Primary metal industries	1.62%	-0.41%	1.21%	25.3%
Metallic ores mining	1.08%	-0.18%	0.90%	16.7%
Radio and TV broadcasting	0.30%	0.55%	0.85%	-183.3%
Air transportation	1.20%	-0.38%	0.82%	31.7%
Nonmetallic minerals mining	1.25%	-0.58%	0.67%	46.4%
Stone, clay and glass	1.10%	-0.49%	0.61%	44.5%
Motor freight transportation and warehousing	0.93%	-0.38%	0.55%	40.9%

Of the 50 industries analyzed, 30 pay more in carbon taxes than they receive in tax reductions, six are essentially unaffected, and 24 benefit from the tax reform. What is striking, however, is that once we get past the top three industries, the price changes are quite modest, not exceeding 1 percent in absolute value.

Summing up, the SAP financed by a carbon tax blunts to a modest degree the price increases that arise from the carbon tax. If the carbon tax is fully passed forward to consumers, then the tax reform benefits the owners of equity in nearly all industry sectors.

This is worth emphasizing. The standard incidence view is that a carbon tax would be passed forward to consumers in the form of higher product prices while capital tax reductions would be passed back to owners of capital. If this view is correct, business (or, more precisely, the equity holders) would generally benefit from corporate tax integration financed by a modest carbon tax.

The SAP above is estimated to cost nearly $45 billion a year. That is based on no growth in corporate profits (and corporate taxes, other than changes resulting from changes in financial policy). If production were Cobb-Douglas with a capital output elasticity of .25, then a 10.2 percent increase in capital would bring about a 2.5 percent increase in output. The decrease in capital use in other sectors would have a spillover effect on the corporate sector as described above. Rather than try to estimate the growth in taxable corporate profits, we present some revenue estimates for different growth assumptions.[9]

TABLE 14

SAP REVENUE ESTIMATES

Growth Rate of Corporate Profits	Change in Corporate Income Tax	Change in Personal Income Tax	Change in Total Taxes
0.0%	11.5	-56.2	-44.7
1.5%	14.6	-56.3	-41.7
3.0%	17.7	-56.5	-38.7
4.5%	20.8	-56.6	-35.7

TABLE 15

DEP REVENUE LOSSES ($BILLIONS)

	Change in Corporate Tax	Change in Personal Tax	Total
Domestic	4.8	-28.8	-24.0
Rest of the world	0.0	-7.2	-7.2
Total	4.8	-36.0	-31.2

Source: Authors' calculations

As the growth rate of corporate profits increases, so do corporate income tax collections. This is offset by a slight decrease in personal income tax collections as corporate income is now taxed at a lower average rate, and non-corporate income falls. Tax collections fall by 20 percent over a reasonable range of growth rates.

The good news is that growth in corporate revenues arising from the shift in capital reduces the need for a substantial carbon tax. A carbon tax raising only $35 to $45 billion a year would not bring about the reductions in carbon use called for in the Kyoto Protocol. Still, a carbon tax of this magnitude would have considerably less of an impact on the economy, and would allow for learning about the efficiency and distributional impacts of a carbon tax if it were decided in the future to increase reliance on this tax to effect a substantial reduction in carbon emissions.

DIVIDEND EXCLUSION PROTOTYPE

The next analysis that we consider is the dividend exclusion prototype (DEP) discussed above. Put simply, dividends are no longer taxable at the personal level. Our assumptions about financial behavior are the same as in the previous section. The shift away from debt is blunted a bit, however, as this prototype only achieves partial tax integration.

Again, note that the pre-tax reform tax on equity equals (.59)(.289) + (.41)(.07) = .199 where the dividend payout ratio for 1996 was 59% and the average marginal tax on dividends is 28.9 percent. Excluding dividends from taxable income at the personal level reduces the tax on equity from 19.9 percent to 2.9 percent. Based on Graham's preferred regression, this reduces the leverage ratio by 2.4 percentage points.

Table 15 presents summary results on the changes in taxation resulting from the DEP.

First, we show the price impacts resulting from corporate tax integration. Table 16 lists the five industries with the lowest price declines and the five with the highest price

[9] We assume a similar growth rate for non-corporate output based on the change in non-corporate capital.

declines (complete results are in Appendix Table A3). The price changes are relatively modest. (Tobacco represents a special case. It had negative net corporate dividends; we need to do further analysis of the correct way to treat this industry.)

The benefits from corporate tax integration are fairly evenly distributed across industry groups, as the greatest benefit is a 1 percent decrease in price (for the finance industry). In contrast, the costs of the carbon tax are highly concentrated as *Table 17* shows.

Three industries face price increases of more than 4 percent, while the remainder face price increases of roughly one percent.

We next turn to the combined effects of the overall tax reform. T*able 18* shows the five industries with the largest gains and losses from the tax reform expressed as a percentage change in price.

A list of price changes for all industries in included in the appendix. Of the 50 industries analyzed, 30 pay more in carbon taxes than they receive in tax reductions, six are essentially unaffected, and 24 benefit from the tax reform. What is striking, however, is that once we get past the top three industries, the price changes are quite modest, not exceeding 1 percent in absolute value.

On the next page in *Table 19*, we once again report the BIS statistic for the industries with the highest net price increase.

The BIS threshold for petroleum refining is lower than under the SAP reform while coal mining is roughly the same. Tobacco products face higher taxes under both the carbon tax and the DEP, and so the BIS is not especially meaningful for this industry.

We can reduce the impact on the top three carbon-intensive industries somewhat by giving preferential dividend exclusion treatment to these industries relative to the remaining sectors. For example, *Table 20 (on the next page)* illustrates the price impacts from excluding all dividends from personal income taxation for the petroleum refining, coal

TABLE 16

CORPORATE TAX INTEGRATION: DEP

Industry	DEP
Least Benefit from Corporate Tax Integration	
Tobacco products	0.18%
Government & other	-0.03%
Real estate	-0.13%
Automotive repair and services	-0.14%
Industrial machinery & other equipment	-0.15%
Greatest Benefit from Corporate Tax Integration	
Finance	-1.05%
Insurance	-1.00%
Communications, except radio and TV	-0.89%
Chemicals & other products	-0.70%
Utilities	-0.60%

TABLE 17

CARBON TAX PRICE INCREASES

Industry	Carbon Tax
Highest Price Increases	
Petroleum refining and related products	8.89%
Coal mining	7.02%
Utilities	4.93%
Primary metal industries	1.10%
Nonmetallic minerals mining	0.86%
Lowest Price Increases	
Insurance	0.07%
Real estate	0.08%
Finance	0.09%
Business services	0.09%
Communications, except radio and TV	0.11%

TABLE 18

DIRECT AND INDIRECT EFFECTS OF GREEN TAX REFORM

Industry	Carbon Tax	DEP	Sum
Highest Price Increases			
Petroleum refining and related products	8.89%	-0.45%	8.44%
Coal mining	7.02%	-0.35%	6.67%
Utilities	4.93%	-0.60%	4.33%
Primary metal industries	1.10%	-0.28%	0.82%
Air transportation	0.84%	-0.19%	0.65%
Highest Price Decreases			
Finance	0.09%	-1.05%	-0.96%
Insurance	0.07%	-1.00%	-0.93%
Communications, except radio and TV	0.11%	-0.89%	-0.78%
Pipelines, freight forwarders, and related services	0.18%	-0.55%	-0.37%
Printing and publishing	0.22%	-0.49%	-0.27%

TABLE 19

BREAKEVEN INCIDENCE SHARES

Industry	Carbon Tax	DEP	Sum	BIS
Petroleum refining and related products	8.89%	-0.45%	8.44%	5.1%
Coal mining	7.02%	-0.35%	6.67%	5.0%
Utilities	4.93%	-0.60%	4.33%	12.2%
Primary metal industries	1.10%	-0.28%	0.82%	25.5%
Air transportation	0.84%	-0.19%	0.65%	22.6%
Stone, clay and glass	0.75%	-0.32%	0.43%	42.7%
Motor freight transportation and warehousing	0.65%	-0.26%	0.39%	40.0%
Nonmetallic minerals mining	0.86%	-0.49%	0.37%	57.0%
Tobacco products	0.16%	0.18%	0.34%	-112.5%
Metallic ores mining	0.75%	-0.50%	0.25%	66.7%

TABLE 20

DIRECT AND INDIRECT EFFECTS OF GREEN TAX REFORM: PREFERENTIAL TREATMENT FOR HEAVILY IMPACTED INDUSTRIES

Industry	Carbon Tax	DEP	Sum	BIS
Highest Price Increases				
Petroleum refining and related products	5.04%	-0.37%	4.67%	7.3%
Coal mining	3.88%	-0.30%	3.58%	7.7%
Utilities	2.75%	-0.61%	2.14%	22.2%
Primary metal industries	0.61%	-0.17%	0.44%	27.9%
Air transportation	0.47%	-0.12%	0.35%	25.5%
Highest Price Decreases				
Finance	0.05%	-0.55%	-0.50%	1100.0%
Insurance	0.04%	-0.51%	-0.47%	1275.0%
Communications, except radio and TV	0.06%	-0.46%	-0.40%	766.7%
Pipelines, freight forwarders, and related services	0.10%	-0.29%	-0.19%	290.0%
Printing and publishing	0.12%	-0.26%	-0.14%	216.7%

TABLE 21

DEP REVENUE ESTIMATES

Growth Rate of Corporate Profits	Change in Corporate Income Tax	Change in Personal Income Tax	Change in Total Taxes
0.0%	4.8	-36.0	-31.2
1.5%	7.9	-36.3	-28.5
3.0%	11.0	-36.7	-25.7
4.5%	14.1	-37.0	-23.0

mining and utility industries while excluding 50 percent of dividends for remaining industries.

While this preferential treatment reduces the price impact for these three industries (and raises the BIS), they still face sharply higher prices relative to other sectors. Moreover, the amount required to be raised by a carbon tax is reduced from $31.5 billion to $17.8 billion. The cost of reducing the inter-industry impacts is a reduced need for carbon tax revenues and impetus for reductions in carbon use.

Finally, we report alternative revenue estimates assuming different growth rates for corporate profits in *Table 21*.

Tax revenues fall about 25 percent when corporate profits rise by 4.5 percent relative to the no growth scenario (a fall of $23 billion as opposed to $31.2 billion).

CONCLUSION

A carbon tax is perhaps the most effective policy tool that the United States can employ to achieve the carbon reductions required by the Kyoto Protocol. Building support for such a tax has been difficult, in part because there has not been a clear discussion of how the revenues from a carbon tax would be used. We argue in this paper that a carbon tax used to finance corporate tax integration could have beneficial efficiency effects. Moreover, the industry impacts are likely to be modest (in the sense of returns to shareholders). Put differently, there is little need to provide substantial additional relief to particular industry sectors in the economy to hold them harmless in the reform.

We close with two additional comments about a carbon tax linked to corporate tax integration.

First, the revenue required of a carbon tax to offset revenue losses from tax integration is relatively modest, and the carbon tax would certainly fall short of levels required to achieve compliance with the Kyoto Protocol. This proposal could be viewed as a first step towards a serious carbon tax, whereby the U.S. gains experience with this new tax before committing to more substantial levels of carbon taxation.

Second, our focus in this paper on industry level distribution of taxes is somewhat unusual and is of interest more from a political economy perspective than a traditional tax incidence perspective. Our focus is dictated by our interest in linking a carbon tax with a tax that would increase economic efficiency. Reductions in capital income taxation are generally held to be more efficient than other types of tax reductions. Corporate tax integration has the added benefit of combining reductions in capital income taxation with an equalizing of tax treatment across various forms of capital.

This focus on efficiency comes at the cost of a likely reduction in overall progressivity in the tax code under this proposed reform. As one of us has noted in previous work (Metcalf (1999)), it is difficult—if not impossible—to improve efficiency and progressivity in a green tax swap involving a carbon tax and some other tax. Whether policymakers choose to emphasize progressivity or efficiency in crafting a green tax reform with a carbon tax is something we cannot predict.

What we have shown in this paper, however, is that it may be possible to develop a coalition of environmental and business groups to support a carbon tax in the United States and that when combined with corporate tax integration, this tax could enhance efficiency while moving the United States into the small but growing camp of countries that have enacted carbon taxes in the past ten years.

We argue in this paper that a carbon tax used to finance corporate tax integration could have beneficial efficiency effects. Moreover, the industry impacts are likely to be modest (in the sense of returns to shareholders).

APPENDIX A: INPUT-OUTPUT ANALYSIS

The input-output accounts trace the production of commodities by industries and the use of those commodities by other industries. Taken together, one can trace the use of inputs produced by one industry and used by all other industries. Adding up various identities along with assumptions about production and trade allow the accounts to be manipulated to trace through the impact of price changes in one industry on the products of all other industries in the economy. A brief description of the use of the input-output accounts follows.[10]

Tracing price changes through the economy on the basis of input-output accounts dates back to work by Leontief (documented in Leontief (1986)). The model makes a number of important assumptions, the most important of which are 1) goods are produced and sold in a perfectly competitive environment such that all factor price increases are passed forward to consumers, 2) domestic and foreign goods are sufficiently different that the price of domestic goods can adjust following changes in factor prices,[11] and 3) input coefficients a_{ij} (the amount of industry i used in the production of industry j) are constant. Thus, input substitution is not allowed as factor prices change. This last assumption means that price responses are only approximate, as they don't allow for product mix changes as relative prices change. In effect, the input-output accounts can be used to trace first order price effects through the economy.

Two sets of equations define the basic input-output accounts. The first set relates the demand for goods from an industry to the value of output from that industry:

(B1)

$$
\begin{aligned}
x_{11}p_1 + x_{12}p_1 + \ldots + x_{1N}p_1 + d_1p_1 &= x_1p_1 \\
x_{21}p_2 + x_{22}p_2 + \ldots + x_{2N}p_2 + d_2p_2 &= x_2p_2 \\
&\vdots \\
x_{N1}p_N + x_{N2}p_N + \ldots + x_{NN}p_N + d_Np_N &= x_Np_N
\end{aligned}
$$

where x_{ij} is the quantity of the output from industry i used by industry j, p_i is the unit price of product i, d_i is the final demand for output i, and x_i is the total output of industry i. These N equations simply say that the value of output from each industry must equal the sum of the value of output used by other industries (intermediate inputs), plus final demand. Without loss of generality, we can choose units for each of the goods so that all prices equal 1. This will be convenient as the expenditure data in the input-output accounts can then be used to measure quantities prior to any taxes that we will impose.

The second set of equations relates the value of all inputs and value added to the value of output:

(B2)

$$
\begin{aligned}
x_{11}p_1 + x_{21}p_2 + \ldots + x_{N1}p_N + v_1 &= x_1p_1 \\
x_{12}p_1 + x_{22}p_2 + \ldots + x_{N2}p_N + v_2 &= x_2p_2 \\
&\vdots \\
x_{1N}p_1 + x_{2N}p_2 + \ldots + x_{NN}p_N + v_N &= x_Np_N
\end{aligned}
$$

where v_i is value added in industry i. Define $a_{ij} = x_{ij}/x_j$, the input of product i as a fraction of the total output of industry j. The system (B2) can be rewritten as

[10] This discussion is based on Metcalf (1999).
[11] Fullerton (1996) terms this the Armington assumption following work by Armington (1969).

(B3)

$$(1-a_{11})p_1 - a_{21}p_2 - \ldots - a_{N1}p_N = v_1/x_1$$
$$-a_{12}p_1 + (1-a_{22})p_2 - \ldots - a_{N2}p_N = v_2/x_2$$
$$\vdots$$
$$-a_{1N}p_1 - a_{2N}p_2 - \ldots + (1-a_{NN})p_N = v_N/x_N$$

These equations can be expressed in matrix notation as

(B3') $$(I - A')P_I = V$$

where I is an $N \times N$ identity matrix, A is an $N \times N$ matrix with elements a_{ij}, P_I is an $N \times 1$ vector of industry prices, p_i, and V is the $N \times 1$ vector whose i^{th} element is v_i/x_i. Assuming that (I-A') is non-singular, this system can be solved for the price vector:

(B4) $$P_I = (I-A')^{-1}V.$$

With the unit convention chosen above, P_I will be a vector of ones. However, we can add taxes to the system, in which case the price vector will now differ from a vector of ones as intermediate goods taxes get transmitted through the system. Specifically, let t_{ij} be a unit tax on the use of product i by industry j. In this case, the value of goods used in production (grossed up by their tax) plus value added now equals the value of output:

(B5)

$$x_{11}p_1(1+t_{11}) + x_{21}p_2(1+t_{21}) + \ldots + x_{N1}p_N(1+t_{N1}) + v_1 = x_1p_1$$
$$x_{12}p_1(1+t_{12}) + x_{22}p_2(1+t_{22}) + \ldots + x_{N2}p_N(1+t_{N2}) + v_2 = x_2p_2$$
$$\vdots$$
$$x_{1N}p_1(1+t_{1N}) + x_{2N}p_2(1+t_{2N}) + \ldots + x_{NN}p_N(1+t_{NN}) + v_N = x_Np_N$$

This set of equations can be manipulated in a similar fashion to the equations above to solve for the price vector:

(B6) $$P_I = (I - B')V$$

where B is an $N \times N$ matrix with elements $(1+t_{ij})a_{ij}$.

We regrouped industries in the input-output accounts into 50 industry groupings. Tax rates are computed as the ratio of required tax revenue from the industry divided by the value of output from that industry. Imagine that a carbon tax is designed to collect \$20 billion on coal. The tax rate applied to the coal industry then equals

$$t_{4.} = \frac{20}{\square_{j=1}^{N} x_{4j}} \quad t_{4.} = \frac{20}{\sum_{j=1}^{N} x_{4j}}$$

where the tax is designed to collect \$20 billion from the coal industry (industry 4). This tax is applied to all variables in the fourth equation of B5. Other industry level taxes are computed in a similar fashion. Some taxes only apply to the output of certain industries used by certain other industries. The treatment of industry 5, crude oil and natural gas, provides an example. The crude oil and natural gas industries are combined into one industry by the input-output accounts. Natural gas, however, is predominantly used by the utilities industries (industry 36) while crude oil goes to the petroleum refining industry (industry 17). Thus, we allocate the tax on natural gas to output from the crude oil and natural gas industry (industry 5) used by the utilities (industry 36), while the carbon tax on petroleum is allocated to the use of industry 5 by the petroleum refining industry (industry 17).

TABLE A1: SAP TAX REVENUE CHANGES

Industry	Corporate Income Tax	Personal Income Tax	Total Taxes
Farms	0.095	-0.166	-0.070
Agricultural, forestry, and fishery services	0.023	-0.121	-0.097
Metallic ores mining	0.048	-0.040	0.009
Coal mining	-0.001	-0.053	-0.054
Crude petroleum and natural gas	0.085	-0.400	-0.315
Nonmetallic minerals mining	0.039	-0.095	-0.056
Construction	0.154	-1.319	-1.165
Food and kindred products	0.887	-2.313	-1.427
Tobacco products	0.029	-0.013	0.015
Textile mill products	0.101	-0.194	-0.093
Apparel and other textile products	0.147	-0.229	-0.082
Lumber and wood products	0.137	-0.267	-0.130
Furniture and fixtures	0.023	-0.159	-0.136
Paper and allied products	0.327	-0.699	-0.373
Printing and publishing	0.295	-1.006	-0.710
Chemicals and other products	0.849	-2.638	-1.789
Petroleum refining and related products	0.378	-0.973	-0.596
Rubber and miscellaneous plastics products	0.183	-0.344	-0.162
Footwear, leather, and leather products	0.018	-0.024	-0.007
Stone, clay, and glass products	0.129	-0.310	-0.181
Primary metal industries	0.144	-0.346	-0.202
Fabricated metal products	0.319	-0.948	-0.629
Industrial machinery and other equipment	0.201	-0.611	-0.410
Electronic and other equipment	0.136	-1.261	-1.125
Motor vehicles and equipment	-0.341	-0.320	-0.661
Other transportation equipment	0.204	-0.474	-0.270
Instruments	-0.128	-0.358	-0.486
Miscellaneous manufacturing	0.091	-0.264	-0.173
Railroad and related services; passenger ground transportation	0.143	-0.318	-0.175
Motor freight transportation and warehousing	0.175	-0.362	-0.187
Water transportation	0.038	-0.077	-0.039
Air transportation	0.103	-0.260	-0.157
Pipelines, freight forwarders, and related services	0.077	-0.226	-0.149
Communications, except radio and TV	0.677	-3.167	-2.491
Radio and TV broadcasting	0.677	-0.411	0.266
Utilities	1.675	-3.605	-1.930
Wholesale trade	0.839	-2.920	-2.081
Retail trade	1.270	-3.662	-2.392
Finance	0.000	-8.674	-8.674
Insurance	0.000	-2.868	-2.868
Real estate	0.000	-0.786	-0.786
Hotels and lodging places	0.131	-0.131	0.000
Personal and repair services (except auto)	0.055	-0.231	-0.176
Business services	0.194	-2.340	-2.146
Eating and drinking places	0.131	-0.131	0.000
Automotive repair and services	0.155	-0.130	0.025
Amusements	0.207	-0.460	-0.253
Health services	0.452	-1.052	-0.601
Educational and social services, and membership organizations	0.004	-0.042	-0.039

Source: Authors' calculations. All revenue in billions of dollars.

TABLE A2: PRICE CHANGES FROM CARBON TAX/SAP REFORM

Industry	Carbon Tax	SAP	Total Taxes	BIS
Farms	0.60%	-0.34%	0.26%	56.7%
Agricultural, forestry, and fishery services	0.32%	-0.48%	-0.16%	150.0%
Metallic ores mining	1.08%	-0.18%	0.90%	16.7%
Coal mining	10.35%	-0.48%	9.87%	4.6%
Crude petroleum and natural gas	0.66%	-0.52%	0.14%	78.8%
Nonmetallic minerals mining	1.25%	-0.58%	0.67%	46.4%
Construction	0.46%	-0.42%	0.04%	91.3%
Food and kindred products	0.51%	-0.65%	-0.14%	127.5%
Tobacco products	0.23%	-0.12%	0.11%	52.2%
Textile mill products	0.76%	-0.62%	0.14%	81.6%
Apparel and other textile products	0.47%	-0.44%	0.03%	93.6%
Lumber and wood products	0.45%	-0.41%	0.04%	91.1%
Furniture and fixtures	0.46%	-0.53%	-0.07%	115.2%
Paper and allied products	0.85%	-0.59%	0.26%	69.4%
Printing and publishing	0.32%	-0.68%	-0.36%	212.5%
Chemicals & other products	0.75%	-0.88%	-0.13%	117.3%
Petroleum refining and related products	12.76%	-0.82%	11.94%	6.4%
Rubber and miscellaneous plastics products	0.56%	-0.47%	0.09%	83.9%
Footwear, leather, and leather products	0.53%	-0.43%	0.10%	81.1%
Stone, clay and glass	1.10%	-0.49%	0.61%	44.5%
Primary metal industries	1.62%	-0.41%	1.21%	25.3%
Fabricated metal products	0.70%	-0.60%	0.10%	85.7%
Industrial machinery & other equipment	0.44%	-0.42%	0.02%	95.5%
Electronic and other equipment	0.41%	-0.61%	-0.20%	148.8%
Motor vehicles and equipment	0.50%	-0.57%	-0.07%	114.0%
Other transportation equipment	0.41%	-0.99%	-0.58%	241.5%
Instruments	0.29%	-0.57%	-0.28%	196.6%
Miscellaneous manufacturing	0.36%	-0.49%	-0.13%	136.1%
Railroads and related services; passenger ground transportation	0.79%	-0.46%	0.33%	58.2%
Motor freight transportation and warehousing	0.93%	-0.38%	0.55%	40.9%
Water transportation	0.45%	-0.40%	0.05%	88.9%
Air transportation	1.20%	-0.38%	0.82%	31.7%
Pipelines, freight forwarders, and related services	0.26%	-0.65%	-0.39%	250.0%
Communications, except radio and TV	0.16%	-1.14%	-0.98%	712.5%
Radio and TV broadcasting	0.30%	0.55%	0.85%	-183.3%
Utilities	7.19%	-0.78%	6.41%	10.8%
Wholesale trade	0.24%	-0.44%	-0.20%	183.3%
Retail trade	0.30%	-0.51%	-0.21%	170.0%
Finance	0.14%	-1.98%	-1.84%	1414.3%
Insurance	0.10%	-1.61%	-1.51%	1610.0%
Real estate	0.11%	-0.16%	-0.05%	145.5%
Hotels and lodging places	0.53%	-0.33%	0.20%	62.3%
Personal and repair services (except auto)	0.28%	-0.35%	-0.07%	125.0%
Business services	0.13%	-0.35%	-0.22%	269.2%
Eating and drinking places	0.32%	-0.22%	0.10%	68.8%
Automotive repair and services	0.28%	-0.16%	0.12%	57.1%
Amusements	0.27%	-0.34%	-0.07%	125.9%
Health services	0.25%	-0.27%	-0.02%	108.0%
Educational and social services, and membership organizations	0.26%	-0.24%	0.02%	92.3%
Government & other	0.30%	-0.04%	0.26%	13.3%

Source: Authors' calculations. The Breakeven Incidence Share (BIS) reports the maximum fraction of carbon tax that can be passed back to equity owners before the return to shareholders falls. A measure greater than 100% means that more than 100% backward shifting of the tax would be required for the reform to harm equity owners.

TABLE A3: PRICE CHANGES FROM CARBON TAX/DEP REFORM

Industry	Carbon Tax	DEP	Sum	BIS
Farms	0.42%	-0.27%	0.15%	64.3%
Agricultural, forestry, and fishery services	0.22%	-0.38%	-0.16%	172.7%
Metallic ores mining	0.75%	-0.50%	0.25%	66.7%
Coal mining	7.02%	-0.35%	6.67%	5.0%
Crude petroleum and natural gas	0.45%	-0.33%	0.12%	73.3%
Nonmetallic minerals mining	0.86%	-0.49%	0.37%	57.0%
Construction	0.32%	-0.28%	0.04%	87.5%
Food and kindred products	0.35%	-0.54%	-0.19%	154.3%
Tobacco products	0.16%	0.18%	0.34%	-112.5%
Textile mill products	0.52%	-0.48%	0.04%	92.3%
Apparel and other textile products	0.32%	-0.34%	-0.02%	106.3%
Lumber and wood products	0.31%	-0.31%	0.00%	100.0%
Furniture and fixtures	0.32%	-0.30%	0.02%	93.8%
Paper and allied products	0.58%	-0.45%	0.13%	77.6%
Printing and publishing	0.22%	-0.49%	-0.27%	222.7%
Chemicals & other products	0.52%	-0.70%	-0.18%	134.6%
Petroleum refining and related products	8.89%	-0.45%	8.44%	5.1%
Rubber and miscellaneous plastics products	0.39%	-0.34%	0.05%	87.2%
Footwear, leather, and leather products	0.36%	-0.32%	0.04%	88.9%
Stone, clay and glass	0.75%	-0.32%	0.43%	42.7%
Primary metal industries	1.10%	-0.28%	0.82%	25.5%
Fabricated metal products	0.48%	-0.39%	0.09%	81.3%
Industrial machinery & other equipment	0.30%	-0.15%	0.15%	50.0%
Electronic and other equipment	0.28%	-0.33%	-0.05%	117.9%
Motor vehicles and equipment	0.34%	-0.35%	-0.01%	102.9%
Other transportation equipment	0.28%	-0.44%	-0.16%	157.1%
Instruments	0.20%	-0.29%	-0.09%	145.0%
Miscellaneous manufacturing	0.25%	-0.32%	-0.07%	128.0%
Railroads and related services; passenger ground transportation	0.55%	-0.33%	0.22%	60.0%
Motor freight transportation and warehousing	0.65%	-0.26%	0.39%	40.0%
Water transportation	0.31%	-0.31%	0.00%	100.0%
Air transportation	0.84%	-0.19%	0.65%	22.6%
Pipelines, freight forwarders, and related services	0.18%	-0.55%	-0.37%	305.6%
Communications, except radio and TV	0.11%	-0.89%	-0.78%	809.1%
Radio and TV broadcasting	0.21%	-0.21%	0.00%	100.0%
Utilities	4.93%	-0.60%	4.33%	12.2%
Wholesale trade	0.16%	-0.30%	-0.14%	187.5%
Retail trade	0.21%	-0.33%	-0.12%	157.1%
Finance	0.09%	-1.05%	-0.96%	1166.7%
Insurance	0.07%	-1.00%	-0.93%	1428.6%
Real estate	0.08%	-0.13%	-0.05%	162.5%
Hotels and lodging places	0.37%	-0.24%	0.13%	64.9%
Personal and repair services (except auto)	0.19%	-0.25%	-0.06%	131.6%
Business services	0.09%	-0.26%	-0.17%	288.9%
Eating and drinking places	0.22%	-0.18%	0.04%	81.8%
Automotive repair and services	0.19%	-0.14%	0.05%	73.7%
Amusements	0.19%	-0.35%	-0.16%	184.2%
Health services	0.17%	-0.19%	-0.02%	111.8%
Educational and social services, and membership organizations	0.18%	-0.17%	0.01%	94.4%
Government & other	0.20%	-0.03%	0.17%	15.0%

Source: Authors' calculations. The Breakeven Incidence Share (BIS) reports the maximum fraction of carbon tax that can be passed back to equity owners before the return to shareholders falls. A measure greater than 100% means that more than 100% backward shifting of the tax would be required for the reform to harm equity owners.

REFERENCES

Armington, Paul. 1969. "A Theory of Demand for Products Distinguished by Place of Production." *International Monetary Fund Staff Papers* 16:159-76.

Ballard, Charles L.; Fullerton, Don; Shoven, John B. and Whalley, John. 1985. *A General Equilibrium Model for Tax Policy Analysis*. Chicago: University of Chicago Press.

Bovenberg, A. Lans and Goulder, Laurence. 2000. "Neutralizing the Adverse Industry Impacts of CO2 Abatement Policies: What Does It Cost?" in *Distributional and Behavioral Effects of Environmental Policy* eds. C. Carraro and G. E. Metcalf. Chicago: University of Chicago Press.

Bovenberg, A. Lans and Goulder, Lawrence H. 1996. "Optimal Environmental Taxation in the Presence of Other Taxes: General Equilibrium Analyses." *American Economic Review* 86:985-1000.

Energy Information Administration. U.S. Department of Energy. 1999. "Emissions of Greenhouse Gases in the United States 1998." Washington, DC.

Feenberg, Daniel. "U.S. Federal Average Marginal Income Tax Rates," National Bureau of Economic Research, 2000.

Feldstein, Martin, Dicks-Mireaux, Louis and Poterba, James. 1983. "The Effective Tax Rate and the Pretax Rate of Return." *Journal of Public Economics* 21:129-58.

Fullerton, Don. 1996. "Why Have Separate Environmental Taxes?," in J. M. Poterba, ed. *Tax Policy and the Economy,* ed. J.M. Poterba. 10:33-70 Cambridge: MIT Press for the National Bureau of Economic Research.

Fullerton, Don; King, A. Thomas; Shoven, John B. and Whalley, John. 1981. "Corporate Tax Integration in the United States: A General Equilibrium Approach." *American Economic Review*, 71(5):677-91.

Gale, William G. and Hassett, Kevin A. 2000. "The Effects of Environmental Tax Shifting on U.S. Capital Formation," San Francisco: Redefining Progress.

Gordon, Roger H. and Mackie-Mason, Jeffrey K. 1990. "Effects of the Tax Reform Act of 1986 on Corporate Financial Policy and Organizational Form," in *Do Taxes Matter?* ed. J. Slemrod. 91-131 Cambridge: MIT Press.

Graham, John R. 1999 "Do Personal Taxes Affect Corporate Financing Decisions?" *Journal of Public Economics,* 73(2):147-85.

Hamond, M. Jeff; DeCanio, Stephen J.; Duxbury, Peggy; Sanstad, Alan H. and Stinson, Christopher H. 1997. *Tax Waste, Not Work*. San Francisco: Redefining Progress.

Harberger, Arnold C. 1962. "The Incidence of the Corporation Income Tax." *Journal of Political Economy*, 70(3):215-40.

Herman, Shelby W. 2000. "Fixed Assets and Consumer Durable Goods." *Survey of Current Business*, 80(April):17-30.

Hubbard, R. Glenn. 1993. "Corporate Tax Integration: A View from the Treasury Department." *Journal of Economic Perspectives*, 7:115-32.

Leontief, Wassily. 1986. *Input-Output Economics*. New York: Oxford University Press.

McLure, Charles E., Jr. 1979. *Must Corporate Income Be Taxed Twice?* Washington, DC: The Brookings Institution.

Metcalf, Gilbert E. 1999. "A Distributional Analysis of Green Tax Reforms." *National Tax Journal*, 52(4):655-81.

Park, Thae S. 2000. "Comparison of BEA Estimates of Personal Income and IRS Estimates of Adjusted Gross Income." *Survey of Current Business*, 80(February):12-22.

Pechman, J. 1985. *Who Paid the Taxes: 1966-85?* Washington DC: The Brookings Institution.

U.S. Department of the Treasury. 1992. *Integration of the Individual and Corporate Tax Systems: Taxing Business Income Once*. Washington, DC: U.S. Government Printing Office.

Weyant, John P. and Hill, Jennifer N. 1999. "The Costs of the Kyoto Protocol: A Multi-Model Evaluation. Introduction and Overview." *The Energy Journal*, 1999 pp. vii-xliv.

Wolff, Gary H. 2000. "When Will Business Want Environmental Taxes?" San Francisco: Redefining Progress.

REDEFINING PROGRESS
1904 Franklin Street
6th Floor
Oakland, CA 94612

Telephone: (510) 444-3041
FAX: (510) 444-3191
E-mail: info@rprogress.org
Web site: www.RedefiningProgress.org

Redefining Progress is a nonprofit, nonpartisan organization that develops policies and tools to reorient the economy so it values people and nature first.