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Working Paper

Lifting the burden: fundamental tax reform and U.S. economic growth

NBB Working Paper, No. 21

Provided in Cooperation with:

National Bank of Belgium, Brussels

Suggested Citation: Jorgenson, Dale W.; Yun, Kun-Young (2002) : Lifting the burden: fundamental tax reform and U.S. economic growth, NBB Working Paper, No. 21, National Bank of Belgium, Brussels

This Version is available at:

<https://hdl.handle.net/10419/144235>

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NATIONAL BANK OF BELGIUM

WORKING PAPERS - RESEARCH SERIES

**LIFTING THE BURDEN: FUNDAMENTAL TAX REFORM
AND U.S. ECONOMIC GROWTH**

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of the National Bank of Belgium.

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B - 1000 Brussels

Imprint: Responsibility according to the Belgian law: Jean Hilgers, Member of the Board of Directors, National Bank of Belgium.

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ISSN: 1375-680X

Editorial

On May 27-28, 2002 the National Bank of Belgium hosted a Conference on "*New views on firms' investment and finance decisions*". Papers presented at this conference are made available to a broader audience in the NBB Working Papers no 21 to 33.

Abstract

This paper presents a comprehensive treatment of the cost-of-capital approach for analyzing the economic impact of tax policy. This approach has provided an intellectual impetus for reforms of capital income taxation in the United States and around the world. The most dramatic example is the Tax Reform Act of 1986 in the United States. In this landmark legislation the income tax base was broadened by wholesale elimination of tax preferences for both individuals and corporations. Revenues generated by base broadening were used to finance sharp reductions in tax rates at corporate and individual levels.

The cost-of-capital approach presented in this paper shows that important opportunities for tax reform still remain. This approach suggests two avenues for reform. One would retain the income tax base of the existing U.S. tax system, but would equalize tax burdens on all forms of assets as well as average and marginal rates on labor income. Elimination of differences in the tax treatment of all forms of assets would produce gains in efficiency comparable to those from the Tax Reform Act of 1986. Equalization of marginal and average tax rates on labor income would more than double these gains in efficiency.

Proposals to replace income by consumption as a tax base were revived in the United States during the 1990's. The Hall-Rabushka Flat Tax proposal would produce efficiency gains comparable to those from equalizing tax burdens on all forms of assets under the income tax. However, a progressive National Retail Sales Tax, collected on personal consumption expenditures at the retail level, would generate gains in efficiency exceeding those from the Flat Tax by more than 50 percent! Equalizing marginal and average rates of taxation on consumption would double the gains from the Flat Tax.

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1. Introduction

When President Ronald Reagan took office in January 1981, there was widespread concern about the slowdown of U.S. economic growth. Tax reform received overwhelming support from the Congress with the enactment of the Economic Recovery Tax Act of 1981. The 1981 Tax Act combined substantial reductions in tax rates with sizable enhancements in incentives for saving and investment.

Beginning with the introduction of accelerated depreciation in 1954 and the investment tax credit in 1962, U.S. tax policy had incorporated progressively more elaborate tax preferences for specific forms of capital income. The 1981 Tax Act brought this development to its highest point with adoption of the Accelerated Cost Recovery System and a ten percent investment tax credit. These tax provisions severed the connection between capital cost recovery and the economic concept of income.

The 1981 Tax Act continued the shift from income to consumption as a tax base that had characterized the postwar period. In order to stimulate saving, individuals were allowed to establish tax-favored accounts. In the United States these took the form of pension funds for corporate and non-corporate businesses and Individual Retirement Accounts. Savings were removed from the tax base by excluding contributions to these accounts from income for tax purposes and exempting earnings from taxation until withdrawn for consumption. The tax base could be shifted from income toward consumption by the simple expedient of allowing larger contributions to the tax-favored accounts.

More rapid write-offs of investment outlays through accelerated cost recovery also provided enhanced investment incentives. Subsidies for investment like the investment tax credit reduced tax liabilities. The ultimate investment incentive is to treat investment expenditures symmetrically with

outlays on current account, thereby removing investment from the income tax base and shifting the base to consumption. Three landmark reports in Sweden, the United Kingdom, and the United States proposed taking these developments to their logical conclusion by replacing income by consumption as a tax base.¹

The tax reforms of the early 1980s substantially reduced the burden of taxation on capital income. However, these policies also heightened discrepancies among tax burdens on different types of capital. This gave rise to Congressional concerns about tax distortions in the allocation of capital. In the State of the Union Address in January 1984 President Reagan announced that he had requested a plan for further reform from the Treasury, initiating a lengthy debate that eventuated in the Tax Reform Act of 1986.²

The 1986 Tax Act abruptly reversed the direction of U.S. tax policy. The income tax base was broadened by wholesale elimination of tax preferences for both individuals and corporations. The investment tax credit was repealed for property placed in service after December 31, 1985. Capital consumption allowances were brought into line with economic depreciation. Revenues generated by base broadening were used to finance sharp reductions in tax rates at corporate and individual levels.³

The 1986 Tax Act reflected a new conceptual framework for the analysis of capital income taxation. This framework had its origins in two concepts introduced in the 1960s—the effective tax rate, pioneered by Arnold C. Harberger (1962, 1966), and the cost of capital, originated by Dale W. Jorgenson (1963, 1965). The concept of the marginal effective tax rate, introduced by Alan J. Auerbach and Jorgenson (1980), combined the cost of capital and the effective tax rate.

Marginal effective tax rates must be carefully distinguished from the average effective tax rates introduced by Harberger (1962, 1966). Marginal and average tax rates differ substantially, since changes in tax laws typically apply only to new assets. In the model of capital as a factor of production introduced by Jorgenson (1963), new and existing assets are perfect substitutes in production, so that marginal rather than average tax rates are relevant for measuring distortions in the allocation of capital.

¹See Sven-Olof Lodin (1978), James E. Meade (1978), and U.S. Treasury (1977).

²An illuminating account for the tax debate preceding the 1986 Tax Act has been given by Jeffrey H. Birnbaum and Alan S. Murray (1987).

³Robert E. Hall and Alvin Rabushka (1983) and David F. Bradford (1986) presented detailed proposals for a consumption-based tax system in the United States. These were rejected in favor of an income-based approach by the U.S. Treasury (1984).

Jorgenson (1993) presented international comparisons of tax reforms for capital income over the period 1980–1990 in the G7 countries—Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States—together with Australia and Sweden. These comparisons were based on marginal effective tax rates for different types of capital income in all nine countries for the years 1980, 1985, and 1990. Nine teams, one from each country, constructed estimates of these tax rates, using a common methodology incorporating that of King and Fullerton (1984).

Jorgenson’s (1993) international comparison of marginal effective tax rates revealed widespread changes in the taxation of income from capital, similar to those in the U.S. Tax Reform Act of 1986. Base broadening through elimination of investment and saving incentives and reductions in tax rates were nearly universal. This resulted in considerable “leveling of the playing field” among different assets. However, wide gaps among effective tax rates remained in all nine countries, so that important opportunities for tax reform still remain.

To evaluate the economic impact of alternative tax reform proposals, we employ a dynamic general equilibrium model.⁴ Equilibrium is characterized by an inter-temporal price system that clears markets for labor and capital services and consumption and investment goods. This equilibrium links the past and the future through markets for investment goods and capital services. Assets are accumulated through investments, while asset prices equal the present values of future services. Consumption must satisfy conditions for inter-temporal optimality of the household sector under perfect foresight. Similarly, investment must satisfy requirements for asset accumulation.

We employ our dynamic general equilibrium model to simulate the economic impact of alternative policies for reforming the taxation of capital income. For this purpose we have designed a computational algorithm for determining the time path of the U.S. economy following the reform. This algorithm is composed of two parts. We first solve for the unique steady state of the economy corresponding to the Tax Policy of 1996, our reference tax policy. We then determine the unique transition path for the U.S. economy, consistent with the initial conditions and the steady state. This is the *base case* for our analysis of changes in tax policy.

The second part of our algorithm is to solve our model for the unique transition path of the U.S. economy following tax reform. We first consider the elimination of differences in marginal effective tax rates among different

⁴Details are given in Jorgenson and Yun (2001)

classes of assets and different sectors—ten alternative programs for reforming the taxation of capital income in the U.S. We also consider the cost of progressivity in the taxation of labor income by comparing the existing labor income tax with a flat labor income tax. These are the *alternative cases* for our tax policy analysis.

We compare the level of social welfare associated with each policy with the welfare level in the base case. We translate these welfare comparisons into monetary terms by introducing an *inter-temporal expenditure function*, giving the wealth required to achieve a given level of welfare for the representative consumer in our model of the U.S. economy. Using this expenditure function, we translate the differences in welfare into differences in wealth.

In the United States proposals to replace income by consumption as a tax base have been revived during the 1990s. These include the Hall-Rabushka (1983, 1995) Flat Tax Proposal, a European-style consumption-based value added tax, and a comprehensive retail sales tax on consumption. We compare the economic impact of these proposals, taking the 1996 Tax Law as our base case. In particular, we consider impact of the Hall-Rabushka Proposal and the closely related Armev-Shelby Proposal. We also consider the economic impact of replacing the existing tax system by a National Retail Sales Tax, levied on personal consumption expenditures at the retail level.

From the economic point of view, the definition of consumption is straightforward. A useful starting point is Personal Consumption Expenditures (PCE) as defined in the U.S. National Income and Product Accounts (NIPA). However, the taxation of services poses important administrative problems reviewed in the U.S. Treasury (1984) monograph on the value-added tax. First, PCE includes the rental equivalent value of owner-occupied housing, but does not include the services of consumers' durables. Both are substantial in magnitude, but could be taxed by the "prepayment method" described by Bradford (1986). In this approach, taxes on the consumption of services would be prepaid by including investment rather than consumption in the tax base.

The prepayment of taxes on services of owner-occupied housing would remove an important political obstacle to substitution of a consumption tax for existing income taxes. At the time the substitution takes place, all owner-occupiers would be treated as having prepaid all future taxes on the services of their dwellings. This is equivalent to excluding not only mortgage interest from the tax base, but also returns to equity, which might be taxed upon the sale of a residence with no corresponding purchase of residential property of equal or greater value. Of course, this argument is vulnerable

to the specious criticism that home owners should be allowed to take the mortgage deduction twice—when they are deemed to have paid all future taxes and, again, when tax liabilities are actually assessed on the services of household capital.

Under the prepayment method, purchases of consumers' durables by households for their own use would be subject to tax. This would include automobiles, appliances, home furnishings, and the like. In addition, new construction of owner-occupied housing would be subject to tax, as would sales of existing renter-occupied housing to owner occupiers. These are political sensitive issues and it is important to be clear about the implications of prepayment as the debate proceeds. Housing and consumers' durables must be included in the tax base in order to reap the substantial economic benefits of substituting consumption for income as a basis for taxation.

Other purchases of services that are especially problematical under a consumption tax would include services provided by nonprofit institutions, such as schools and colleges, hospitals, and religious and eleemosynary institutions. The traditional, tax-favored status of these forms of consumption would be tenaciously defended by recipients of the services and, even more tenaciously, by the providers. For example, elegant, and sometimes persuasive arguments can be made that schools and colleges provide services that represent investment in human capital rather than consumption. However, consumption of the resulting enhancements in human capital often takes the form of leisure time, which would remain the principal untaxed form of consumption. Taxes could be prepaid by including educational services in the tax base.

Finally, any definition of a consumption tax base must distinguish between consumption for personal and business purposes. Ongoing disputes over exclusion of home offices, business-provided automobiles, equipment, and clothing, as well as business-related lodging, entertainment, and meals would continue to plague tax officials, the entertainment and hospitality industries, and users of expense accounts. In short, substitution of a consumption tax for the existing income tax system would not eliminate the practical issues that arise from the necessity of distinguishing between business and personal activities in defining consumption. However, these issues are common to the two tax bases.

The first issue that will surface in the tax reform debate is *progressivity* or use of the tax system to redistribute economic resources. We consider alternative tax reform proposals that differ in their impact on the distribution of resources. However, our simulations are limited to the efficiency impacts

of these proposals.⁵ One of our most important findings is that redistribution through tax policy is very costly in terms of efficiency. Unfortunately, there is no agreed-upon economic methodology for trading off efficiency and equity. It is, nonetheless, important to quantify the impact of alternative tax policies on the efficiency of resource allocation.

The second issue to be debated is *fiscal federalism*, or the role of state and local governments. Since state and local income taxes usually employ the same tax bases as the corresponding federal taxes, it is reasonable to assume that the substitution of a consumption tax for income taxes at the federal level would be followed by similar substitutions at the state and local level. For simplicity, we consider the economic effect of substitutions at all levels simultaneously. Since an important advantage of fundamental tax reform is the possibility, at least at the outset, of radically simplifying tax rules, it makes little sense to assume that these rules would continue to govern state and local income taxes, even if federal income taxes were abolished.

The third issue in the debate will be the impact of the *federal deficit*. Nearly two decades of economic disputation over this issue have failed to produce a clear resolution. No doubt this dispute will continue to occupy the next generation of fiscal economists, as it has the previous generation. An effective device for insulating the discussion of fundamental tax reform from the budget debate is to limit consideration to revenue neutral proposals. This device was critical to the eventual enactment of the Tax Reform Act of 1986 and is, we believe, essential to progress in the debate over fundamental tax reform.

2. Tax Reform Proposals

The subtraction method for implementing a consumption tax is the basis for the ingenious Flat Tax proposed by Hall and Rabushka (1995). The Hall-Rabushka (HR) proposal divides tax collections between firms and households. Firms would expense the cost of all purchases from other businesses, including purchases of investment goods, as in the subtraction method for implementing a consumption tax. However, firms would also deduct all purchases of labor services, so that labor compensation—wages and salaries, health insurance, pension contributions, and other supplements—would be

⁵For distributional effects of fundamental tax reform, see Hall (1996, 1997), Fullerton and Rogers (1996), Feenberg, Mitrusi, and Poterba (1997), Gravelle (1995), and Gentry and Hubbard (1997). On transition and other issues, see McLure (1993), Sakar and Zodrow (1993), Poddar and English (1997), Fullerton and Rogers (1997), Engen and Gale (1997), Fox and Murray (1997), Hellerstein (1997), and Bradford (2000).

taxed at the individual level. This would permit the introduction of allowances for low-income taxpayers in order to redistribute economic resources through the Flat Tax.

Taxation of business firms under the HR proposal is different from the current income tax system in three ways. First, a flat rate is applied to the tax base, hence the identification of this proposal as the Flat Tax. Second, interest paid by the firm is treated as part of property income and is no longer deducted from the tax base. Third, investment spending is recovered through immediate write-offs rather than depreciation over time, so that the effective tax rate on capital is zero. The inclusion of interest payments in the tax base eliminates the differential tax treatment of debt and equity, insuring the financial neutrality of the tax system.

The federal tax rate proposed by HR is 19% for both businesses and individuals. However, if unused depreciation from capital accumulation pre-dating the tax reform is allowed as a deduction from the tax base, the tax rate will rise to 20.1%. Personal allowances under the Hall-Rabushka proposal for 1995 are \$16,500 for married taxpayers filing jointly, \$14,000 for head of household, and \$9,500 for single taxpayer. The allowance for each dependent is \$4,500. A family of four with two adults filing jointly, for example, is entitled to a deduction of \$25,500. Personal allowances are indexed to the Consumer Price Index (Hall-Rabushka, 1995, p. 144).

The Armey-Shelby (AS) proposal, introduced in the 104th Congress by Representative Dick Armey and Senator Richard Shelby, is best considered as a variant of the HR Flat Tax proposal. The principal differences between HR and AS are the Flat Tax rate and the level of personal allowances. The AS Flat Tax rate is 20% for the first two years and 17% thereafter. Compared with the HR tax rate of 19%, the AS rate is higher during the first two years by one percentage point, but lower by two percentage points thereafter. Personal allowances under AS are \$21,400 for married taxpayers filing jointly, \$14,000 for head of household, and \$10,700 for single taxpayers. The allowance for each dependent is \$5,000, so that a family of four with two adults filing jointly would be entitled to a deduction of \$31,400.

The AS proposal is more generous to the taxpayer than the HR proposal in the sense that the Flat Tax rate is lower after the first two years and the family allowances are higher. The natural question is, would the AS proposal raise sufficient tax revenue to replace the income tax system? Since Hall and Rabushka have calibrated their proposal to the National Income and Product Accounts of 1993 and set the Flat Tax rate to make the HR proposal revenue neutral, it is clear that tax revenue under the AS would fall short of the level

required for neutrality. We will show, however, that revenues raised under either Flat Tax proposal would be substantially below this level.

A proposal for replacing the income tax system with a National Retail Sales Tax has been introduced by Representatives Dan Schaefer, Bill Tauzin (ST), and others.⁶ The ST proposal replaces personal and corporate income taxes, estate and gift taxes, and some excise taxes with a 15% national retail sales tax on a tax-inclusive consumption base. On this definition the tax base would include sales tax revenues as well as the value of retail sales to consumers. The tax rate would be lower on a tax-inclusive basis than a tax-exclusive basis, that is, where the sales tax base excludes the tax revenues. The tax rate under the ST proposal would be 17.6% on a tax-exclusive base. The ST proposal allows for a family consumption refund for qualified family units in order to redistribute economic resources.⁷

Americans for Fair Taxation (AFT) have advanced an alternative proposal for a National Retail Sales Tax. The AFT proposal replaces personal and corporate income taxes, estate and gift taxes, and the payroll tax with a 23% national retail sales tax on a tax-inclusive base similar to that of the ST proposal (29.9% on a tax-exclusive base). The AFT proposal is more ambitious than the ST proposal in that it replaces the payroll tax, used to fund entitlements such as Social Security and Medicare, as well as the income tax system. This has two important implications. The first is that the unfunded liabilities of the entitlement systems would ultimately have to be funded through the sales tax. The second is that a revenue neutral tax rate would be very high.

Gale (1999) estimates that, assuming perfect compliance and no politically motivated erosion of the statutory tax base, the tax-exclusive sales tax rate has to be as high as 31.6% for the ST proposal and 53.6% for the AFT proposal to achieve revenue neutrality.⁸ Comparison of these tax rates with the proposed rates of 17.6% and 29.9% reveals the dimensions of the potential revenue shortfall. Furthermore, if state and local income taxes are replaced along with the federal taxes, the tax rates have to be about 30% higher for the AFT proposal and 50% higher for the ST proposal.

A very high tax rate of the National Retail Sales Tax provides powerful incentives for tax evasion and renders effective tax administration diffi-

⁶The ST proposal was first introduced in the 104th Congress of 1996 and again in the 105th Congress in 1997. See Schaefer (1997).

⁷The refund is equal to the tax-inclusive tax rate times the lesser of the poverty level and the wage and salary income of the family unit.

⁸See also discussions in Aaron, Gale, and Sly (1999).

cult. Although it is possible to mitigate compliance problems, controlling the erosion of the tax base within a tolerable limit appears to be more problematical.⁹ To achieve revenue neutrality through a National Retail Sales Tax, we consider a number of alternatives to the ST and AFT proposals. In all of these alternatives, the capital income tax would be eliminated. We construct a prototype NRST and then develop alternative proposals by varying the degree of progressivity and the division of revenues between a labor income tax and a sales tax. Both the sales tax and the labor income tax may be flat, that is, proportional to the tax base, or may be made progressive by introducing a system of family allowances.

3. Modeling the Tax Reform Proposals

We maintain the role of the property tax in the existing U.S. tax system in all of our simulations. However, we consider alternative treatments of existing sales taxes on consumption and investment goods. The key tax parameter of the HR and AS proposals is the Flat Tax rate. If investment is expensed, the effective tax rate on capital income is equal to zero, whatever the Flat Tax rate, so that the choice of this rate does not affect inter-temporal resource allocation. On the other hand, the Flat Tax rate plays a very important role in the labor-leisure choice of households. It also affects the tax burden on capital assets already accumulated at the time of the tax reform.

Provided that the value added by a business firm is greater than its compensation for labor input, the marginal and average tax rates are the same as the statutory flat rate. However, a large number of households are exempt from taxation due to personal allowances. For tax-exempt households, the average tax rate is zero and for most of them the marginal tax rate is zero as well. We represent the distribution of marginal tax rates between zero and the Flat Tax rate by the average marginal tax rate for labor income. At the same time, we measure the average tax burden on labor income by the average tax rate.

Under the HR proposal the statutory Flat Tax rate is 19%. Under the

⁹On the tax evasion of consumption tax, see Murray (1997) and Mikesell (1997). To deal with the compliance problem, Zodrow (1999) proposes withholding at the manufacturing and wholesale level, bringing the NRST closer to a VAT. To reduce the administrative burden and insure the deduction of investment spending, he proposes a “business tax rebate” for inputs that can be used for both business and personal purposes. The purchaser of such an input would pay the tax at the time of the purchase, but business purchasers would be eligible for a tax rebate.

AS proposal a Flat Tax rate of 20% applies in the first two years after the tax reform, followed by a lower rate of 17% thereafter. These rates are chosen in order to replace federal tax revenues. In our model all three levels of government—federal, state, and local—are combined into a single government sector. If the federal income tax is replaced by a Flat Tax, we assume that the state and local income taxes are also replaced by a Flat Tax. In addition, we assume that the state and local Flat Tax is deductible at the federal level. We then calibrate the Flat Tax system to the 1996 federal and state and local income tax revenues.

Specifically, we assume that the federal and state and local Flat Tax revenues are generated according to the equations

$$R_F^f = (B - R_F^s) \cdot t_F^f \quad (1)$$

$$R_F^s = B \cdot t_F^s \quad (2)$$

where B is the state and local flat tax base, t_F^f and t_F^s are the Federal and the state and local Flat Tax rates and R_F^f and R_F^s are the corresponding tax revenues. The Flat Tax rate for the government sector, t_F , is defined as

$$t_F = t_F^s + t_F^f(1 - t_F^s) \quad (3)$$

where the expression in the parenthesis reflects the deduction of state and local taxes at the federal level.

Since the federal Flat Tax rate, t_F^f , is known, we first set federal and state and local revenues, R_F^f and R_F^s , equal to the federal and the state and local corporate income tax revenues of 1996, \$194.5 billion and \$34.5 billion, respectively. We then solve equations (1) and (2) for the state and local Flat Tax rate, t_F^s , and obtain the overall Flat Tax rate, t_F , from equation (3). The resulting Flat Tax rates are $t_F = 0.2164$ for the HR proposal and $t_F = 0.1943$ for the AS proposal. These rates may be compared with the corporate income tax rate $t_q = 0.3880$ at federal, state, and local levels, corresponding to the federal corporate income tax rate of 0.35 under the 1996 Tax Law.

The average marginal tax rate for labor income is defined as a weighted average of the marginal tax rates of individual taxpayers, where the share of labor income for each taxpayer in total labor income is used as the weight. The average tax rate is simply the total tax revenue divided by total labor income. Using the same National Income and Product Accounts for 1993 as Hall and Rabushka (1995, p. 57, table 3.1), we estimate that the average labor income tax rate is 0.0855 for the HR Flat Tax proposal.

In order to determine the average marginal tax rates for the HR and AS proposals on a consistent basis, we require the distribution of labor income by the marginal tax rate of the individual taxpayer. We use the 1996 Current Population Survey to estimate the average and the average marginal tax rates on labor income for both the HR and AS Flat Tax proposals.¹⁰ We find that the average tax rates on labor income at the federal level, t_L^{af} , are 0.1232 for HR and 0.0961 for AS, and the corresponding average marginal tax rates, t_L^{mf} , are 0.1797 and 0.1551, respectively.

In order to determine the average marginal tax rate on labor income for the government sector as a whole, we follow the same procedure as in calculating the marginal rate t_F . In place of the corporate income tax revenues, we use the individual income tax revenues for 1996. The results are that the average marginal tax rate, t_L^m , is 0.2114 for HR and 0.1834 for AS. The corresponding figure for the Tax Law of 1996 is 0.2645. We could have used a similar approach for estimating the average tax rates for the government sector. However, in order to reflect the realities of tax administration, we estimate the average tax rate, t_L^a , as

$$t_L^a = \frac{t_L^{af} \cdot t_{P96}^a}{t_{P96}^{af}},$$

where t_{P96}^a is the average tax rate of individual income in 1996 and t_{P96}^{af} is the average federal tax rate on individual income in the same year.¹¹ Our estimate of t_L^a is 0.1202 for HR and 0.0938 for AS. These figures may be

¹⁰Suppose there are H taxable units indexed by h , $h = 1, \dots, H$. Let W_h and A_h be the labor income and personal exemptions of taxable unit h . Then the average tax rate at the federal level, t_L^{af} , and the corresponding average marginal tax rate, t_L^{mf} , are defined as

$$t_L^{af} = \frac{\sum_{W_h - A_h > 0} (W_h - A_h) t_F^f}{\sum_{j=1}^H W_h}, \quad t_L^{mf} = \frac{\sum_{W_h - A_h > 0} W_h \cdot t_F^f}{\sum_{h=1}^H W_h}$$

where t_F^f is the statutory federal flat tax rate applicable to labor. We assume that married couples file jointly. We are indebted to M.S. Ho for these calculations. For more details, see Ho and Stiroh (1998).

¹¹Note that t_{P96}^{af} is estimated from a sample of tax returns in the Statistics of Income and t_L^{af} is based on the data from the Current Population Survey for 1996. We estimate that $t_{P96}^a = 0.1411$ and $t_{P96}^{af} = 0.1445$, based on the U.S. National Income and Product Accounts. This procedure adjusts the average tax rate of labor income for less than perfect tax compliance and administration. For more details, see chapter 7 in Jorgenson and Yun (2001).

compared with the corresponding figure of 0.1266 for the 1996 Tax Law, or with the federal tax rate of 0.0855 estimated by Hall and Rabushka.

We can summarize the tax rates as follows:

Hall-Rabushka

Business tax rate, average and marginal: $t_F = 0.2164$

Labor income tax rate, marginal: $t_L^m = 0.2114$

Labor income tax rate, average: $t_L^a = 0.1202$

Armey-Shelby

Business tax rate, average and marginal: $t_F = 0.1943$

Labor income tax rate, marginal: $t_L^m = 0.1834$

Labor income tax rate, average: $t_L^a = 0.0938$

Tax Law of 1996

Corporate income tax rate: $t_q = 0.3880$

Labor income tax rate, marginal: $t_L^m = 0.2645$

Labor income tax rate, average: $t_L^a = 0.1266$

We develop a number of alternative plans for the NRST by combining a sales tax on consumption and a labor income tax. In all of the alternative plans the capital income tax is eliminated. Although the existing sales taxes on investment spending may or may not be abolished, we prefer the policies with no sales tax on investment. As before, property taxes are left unchanged in our simulations. The alternative proposals differ in progressivity. They also differ in the division of revenue-raising roles between the sales tax and the labor income tax. This division has the effect of altering the relative tax burden between labor income and capital accumulated prior to the tax reform.

In order to develop alternative plans, we first construct a prototype sales tax and a prototype labor income tax. The labor income tax is based on the HR Flat Tax proposal. The sales tax has a flat tax rate with personal exemptions. We set the proportion of total exemptions in retail sales equal to the proportion of total exemptions in HR, which is 0.3516. Assuming that the federal sales tax rate is 17% as in Aaron and Gale (1996, table 1.1), we estimate that the corresponding average tax rate is 11.02%. In order to represent the current sales taxes, used mainly by the state and local governments, we add a flat tax of 5.8% to the progressive tax system we have derived. At this point, we have a progressive NRST with a marginal tax rate of 22.80% and an average tax rate of 16.82%.

We construct eight alternative NRST plans. Each plan consists of two parts—a sales tax and a labor income tax. The first two plans are limited to

a sales tax, while the last two consist of a labor income tax alone. Although these two plans are not sales taxes in the usual sense, they provide benchmarks for analyzing the effects of the NRST plans on resource allocation and economic welfare. We evaluate the efficiency of resource allocation under all of the eight plans. However, we consider plans involving a sales tax as the most interesting proposals for implementing the NRST.

In Plan 1, a progressive NRST replaces the capital and labor income taxes. Since the revenue requirement is very large in relation to the sales tax base, we start with tax rates twice as high as those of the prototype, that is

$$t_C = 2 * (0.17 + 0.058) = 0.4560,$$

and

$$t_C^a = 2 * (0.1102 + 0.058) = 0.3365,$$

$$t_L^m = t_L^a = 0,$$

where t_C is the average marginal tax rate and t_C^a is the average tax rate. These sales tax rates serve as the starting values for our simulations and will be adjusted to meet the budget constraints of the government sector.

In Plan 2, we remove the progressivity from the sales tax of Plan 1 and set the marginal tax rate equal to the average tax rate, so that

$$t_C = t_C^a = 0.3365,$$

$$t_L^m = t_L^a = 0.$$

In Plan 3, we introduce the prototype labor income tax from the HR Flat Tax proposal and combine it with the prototype sales tax with the progressivity removed. As a consequence, the sales tax is flat while the labor income tax has the same progressivity as HR. Compared with Plan 1, the role of the sales tax as an instrument for tax collection and redistribution is substantially reduced. Specifically, we set

$$t_C = t_L^a = 0.1682,$$

$$t_L^m = 0.2114,$$

$$t_L^a = 0.1202.$$

In Plan 4, we replace the current income tax system with the combination of a flat sales tax and a flat labor income tax. Since no attempt is made to redistribute economic resources through the tax system, this plan may

be politically unpopular. On the other hand, the efficiency loss is minimal. In this sense, Plan 4 provides a useful benchmark for the possible trade-offs between equity and efficiency. The sales tax rate is set at the average tax rate of the prototype NRST and the labor income tax rate is set at the average tax rate of the HR proposal, so that

$$t_C = t_C^a = 0.1682,$$

$$t_L^m = t_L^a = 0.1202.$$

Plan 5 combines a progressive sales tax with a flat labor income tax. Although the sales tax redistributes economic resources, the revenue-raising function is shared with the flat labor tax and there is less redistribution than in Plan 1. The sales tax is the same as in the prototype sales tax plan and the rate of the labor income tax is set at the average tax rate of the HR proposal, so that

$$t_C = 0.2280,$$

$$t_C^a = 0.1682,$$

$$t_L^m = t_L^a = 0.1202.$$

Plan 6 combines the prototype sales tax with the labor income tax of the HR proposal. Since both segments of the plan are progressive, the sacrifice of efficiency may be substantial. The tax parameters are

$$t_C = 0.2280,$$

$$t_C^a = 0.1682,$$

$$t_L^m = 0.2114,$$

$$t_L^a = 0.1202.$$

In Plan 7, the labor income tax is flat and there is no sales tax. The average and the average marginal tax rates of labor income are equal. Since all the replacement tax revenue is raised by the tax on labor, we start with a labor income tax rate twice that of the HR Flat Tax proposal

$$t_C = t_C^a = 0,$$

$$t_L^m = t_L^a = 0.2404.$$

Finally, in Plan 8, we introduce an element of progressivity into Plan 7 by setting the average marginal tax rate of labor income at twice the level in the HR proposal

$$\begin{aligned} t_C &= t_C^a = 0, \\ t_L^m &= 0.4228, \\ t_L^a &= 0.2404. \end{aligned}$$

Business investment is expensed in the HR and AS Flat Tax proposals. In the NRST proposals household investment is taxed as consumption, which may be interpreted as a prepayment of taxes on the services of household capital. To represent the Flat Tax proposals of HR and AS and the various NRST plans, we must determine the allocation of gross private investment among the three private sectors—corporate, noncorporate, and household. To determine the investment in each of these sectors, we first allocate the total value of investment among the six asset categories in proportion to the capital stock. This is equivalent to assuming that the capital stocks in the three private sectors grow at the same rate.

Next we add the current value of economic depreciation to obtain the gross investment, VIG_i , in asset category i , so that

$$VIG_i = \left(\delta_i + \frac{VIN}{VK} \right) VK_i,$$

where δ_i is the economic depreciation rate, VIN is the total value of net private investment, VK is the total current value of lagged private capital stock, and VK_i is the current value of lagged capital stock in asset category i . In this expression VIN and VK are defined as

$$VIN = (IS - IG - IR) \cdot PI - D$$

$$VK = VKL(1 + \pi)$$

where IS is the total supply of investment goods, IG is the government demand for investment goods, IR is the demand from the rest of the world, PI is the price of investment goods, and D is economic depreciation on private capital. In a steady state the allocation of gross investment across the asset categories takes a simpler form:

$$VIG_i = [(1 - \alpha_T)(1 + n) - (1 - \delta_i)]VK_i$$

where $-\alpha_T$ is the rate of technical change, and n is the growth rate of time endowment.

We preserve revenue neutrality by requiring the government sector to follow the same time paths of real spending and government debt under all the tax reform proposals. We also fix the time path of the claims on the rest of the world. These assumptions are necessary to separate the economic impacts of alternative tax policies from the effects of changes in the government budget and the balance of payments. Government revenues must be adjusted through changes in the tax policy instruments in order to satisfy the government budget constraints in every period along the transition path to a steady state.

In some simulations we take Flat Tax rate in the HR and AS proposals or the sales tax or labor income tax rates in the NRST plans to be fixed and vary other taxes in order to meet the government budget constraints. In other simulations we vary the tax rates themselves to meet these constraints, so that the rates we have derived serve only as starting values. For example, in the case of the HR and AS proposals, the simulation with adjustment of the Flat Tax rate, where t_F , t_L^m , and t_L^a are adjusted simultaneously and in the same proportion, will generate a configuration of the U.S. tax system that is revenue neutral. Similarly, in the analysis of an NRST plan, adjustment of the sales tax and the labor income tax rates achieves revenue neutrality. In the sales tax adjustment, t_C and t_C^a are adjusted in the same proportion; in the labor income tax adjustment, t_L^m and t_L^a are adjusted similarly.

In the HR and AS proposals the effective tax rate on investment is zero, reducing the tax wedge between returns to investors and earnings of savers. The remaining distortion at the inter-temporal margin of resource allocation is due to the property tax and the sales tax on investment goods. In the NRST all taxes on capital income are abolished and the sales tax on investment goods is abolished as well in some of the alternatives we consider. The only remaining source of inter-temporal distortions is the property tax. In our model the sales tax on investment goods affects the producer price of investment goods. Therefore, formulas for the cost of capital are not affected by the tax.

The price of capital services from one unit of capital, P_j , is:

$$P_j = \left[RD_j + \frac{1 - D \cdot t_F}{1 - t_F} \cdot t_s^P \right] \cdot q_j, \quad j = QS, QL, MS, ML \quad (4)$$

$$P_j = [RD_j + (1 - D \cdot t_L^m)t_s^P] \cdot q_j, \quad j = HS, HL \quad (5)$$

where RD is the gross discount rate, t_F is the Flat Tax rate, t_s^P is the property tax rate, q_j is the lagged price of a capital asset, the subscript j stands

for the short-lived and long-lived assets in the corporate, noncorporate, and household sectors, and s stands for the three private sectors. For the corporate sector $s = q$ if $j = QS, QL$ for short-lived and long-lived assets, respectively; $s = m$ for the noncorporate sector if $j = MS, ML$; and $s = h$ for the household sector if $j = HS, HL$. $D = 1$ if property tax is deductible and $D = 0$, otherwise.

In the HR and AS Flat Tax proposals, the labor income tax is the only tax, other than property tax, that is collected directly from the household sector. Hence, we allow the property tax as a deduction from labor income. The gross discount rate, RD_j , is defined as the sum of the after-tax real discount rate and the economic depreciation rate adjusted for inflation:

$$\begin{aligned} RD_j &= (1 - \beta_s)(\rho^e - \pi) + \beta_s(i - \pi) + (1 + \pi)\delta_j, \\ j &= QS, QL, MS, ML, HS, HL \quad \text{and} \quad s = q, m, h \end{aligned} \quad (6)$$

where ρ^e is the after-tax nominal rate of return to equity, i is the nominal interest rate, β_s is the debt/asset ratio, π is inflation rate, and δ_j is the rate of economic depreciation.

Equations (4)–(6) apply to the HR and AS proposals, as well as the NRST. However equation (5) must be interpreted with some care. Investment spending on household assets is included in the sales tax base under the NRST. The most important type of investment spending is the purchase of owner-occupied housing. We model the sales tax on household investment by imposing taxes on sales to the household sector. At the same time we increase the price of capital services by the amount of the sales tax. This treatment of the sales tax on household investment is equivalent to prepayment of the consumption tax on household capital services. Thus, we may interpret (5) as the “producer” price of household capital services, while the corresponding “consumer” price is defined as:

$$P_j^C = (1 + t_C)[RD_j + t_h^P] \cdot q_j, \quad j = HS, HL \quad (5')$$

where we set $D = 0$.

4. Welfare Impacts of Fundamental Tax Reform

Table 1 summarizes the key tax parameters of the fundamental tax reform proposals and tables 2a and 2b report the estimated welfare effects. In table 2a, we present two sets of results. In the first set of simulations the corporate and individual income taxes of 1996 are replaced by the HR or AS

Flat Tax, while sales taxes on consumption and investment goods remain unchanged (column 2). In the second set of simulations we replace the sales taxes as well, so that $t_C = t_C^a = t_I = 0$ (column 3). In the second set of simulations, all the inter-temporal distortions, except for the property tax, are eliminated since $t_I = 0$.

With the initial Flat Tax rates both the HR and the AS proposals fall short of revenue neutrality. The welfare impact of these proposals depends on the tax instrument chosen for raising the necessary revenue. If sales taxes on consumption goods and investment goods are maintained, the welfare gains are in the ranges of \$2.06–3.64 trillion for HR and \$1.23–4.17 trillion for AS, measured in 1997 dollars. Converted into annual flows at the long run real private rate of return of 4.45%, the welfare gains are in the range of \$92–162 billion for HR and \$55–186 billion for AS.

The largest welfare gains are obtained when a lump sum tax is used to compensate for the revenue shortfall. Since the lump sum tax is not available in practice, the welfare gains for the lump sum tax adjustment may be interpreted as the potential gains in welfare from a Flat Tax proposal. If both income taxes and sales taxes are replaced by a Flat Tax and a lump sum tax is used to compensate for the revenue shortfall, the welfare gains are very substantial, \$3.64 trillion for HR and \$4.17 trillion for AS. If sales taxes, as well as corporate and individual income taxes, are replaced with a Flat Tax and a lump sum tax is used to raise the additional revenue, the gains are even larger, almost \$5 trillion for HR and \$5.39 trillion for AS.

The welfare gains from the Flat Tax proposals are lower when distorting taxes are increased to meet the revenue requirement. The actual welfare gain depends critically on the taxes that are replaced and the tax distortions introduced to meet the revenue requirement. If the Flat Tax rate is adjusted to make up the revenue shortfall, substitution of the HR Flat Tax for corporate and individual income taxes would produce a welfare gain of only \$2.06 trillion. If sales taxes are also replaced the gain falls to \$0.81 trillion. The corresponding welfare gains for the AS Flat Tax are \$1.23 trillion for replacement of income taxes and a negative \$0.76 trillion for replacement of sales taxes as well. These results imply that the distortions resulting from the Flat Tax are worse than those from the sales tax at the margin.

The most interesting cases in table 2a are the simulations where personal allowances are held fixed and the Flat Tax rate is adjusted to make up lost revenue. The welfare gains are \$2.06 trillion for the HR proposal and \$1.23 trillion for AS proposal. The reason for the relatively poor performance of

Table 1. Tax parameters of fundamental tax reform proposals–Lump sum tax adjustment, central cases

Tax Reform Proposal	t_q or t_F	t_L^m	t_L^a	t_C	t_C^a	t_I
1. Base Case						
(1) Tax Law of 1996	0.3880	0.2645	0.1265	0.0580	0.0580	0.0580
2. Flat Tax						
(1) Hall-Rabushka	0.2164	0.2114	0.1202	0.0580	0.0580	0.0580
(2) Armey-Shelby	0.1943	0.1834	0.0938	0.0580	0.0580	0.0580
3. National Retail Sales Tax						
(1) Progressive Sales Tax and No Labor Income Tax	0.0	0.0	0.0	0.4560	0.3365	0.0
(2) Proportional Sales Tax and No Labor Income Tax	0.0	0.0	0.0	0.3365	0.3365	0.0
(3) Proportional Sales Tax and Progressive Labor Income Tax	0.0	0.2114	0.1202	0.1682	0.1682	0.0
(4) Proportional Sales Tax and Proportional Labor Income Tax	0.0	0.1202	0.1202	0.1682	0.1682	0.0
(5) Progressive Sales Tax and Proportional Labor Income Tax	0.0	0.1202	0.1202	0.2280	0.1682	0.0
(6) Progressive Sales Tax and Progressive Labor Income Tax	0.0	0.2114	0.1202	0.2280	0.1682	0.0
(7) No Sales Tax, Proportional Labor Income Tax	0.0	0.2404	0.2404	0.0	0.0	0.0
(8) No Sales Tax, Progressive Labor Income Tax	0.0	0.4228	0.2404	0.0	0.0	0.0

Notes:

1. In the central case, $t_C = t_C^a = t_I = 0.058$ for the flat tax (HR and AS), and $t_I = 0$ for the NRST.

2. In the cases of flat tax adjustment, the values of t_F , t_L^m , and t_L^a in the table are used as the starting values for iteration. Similarly for sales tax and labor income tax adjustment.

t_F : flat tax rate

t_L^m : average marginal tax rate of labor income

t_L^a : average tax rate on labor income

t_C : average marginal tax rate on retail sales

t_C^a : average tax rate on retail sales

t_I : sales tax rate on investment spending

the AS proposal is the higher marginal tax rate on labor.¹² Recall that that the HR proposal has a higher tax rate than the AS proposal. However, given the constraint imposed by fixed time paths of government debt and real government spending, the more generous personal allowances in the AS proposal imply a higher tax rate. This point is corroborated in table 3 and figures 1a and 1b, where the transition paths of the Flat Tax rate and the average and marginal tax rates of the labor income tax are given.¹³

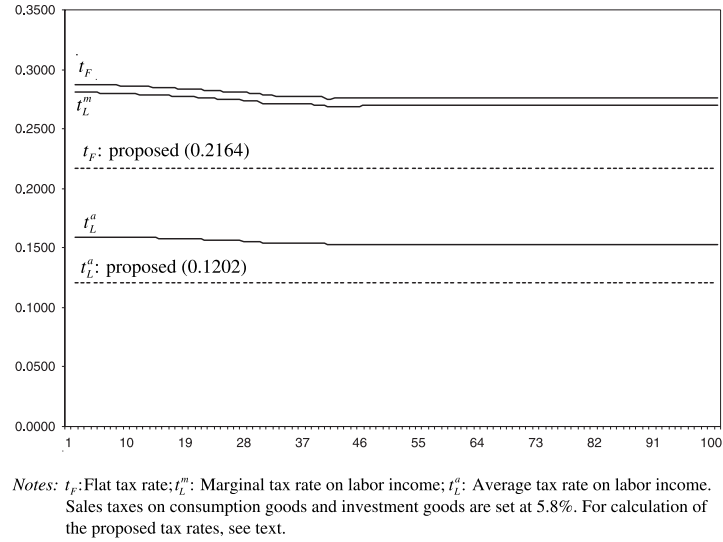


Figure 1a. Transition paths of tax rates: Flat tax, Hall-Rabushka.

¹²A high flat tax rate implies a heavy lump sum tax on “old” capital, offsetting the distorting effects of the tax on labor.

¹³Tables A.1–A.4 in the appendix present the transition paths of full consumption, labor supply, capital stock, and the real private rate of return under the HR and AS proposals and Plans 1 and 2 of the NRST.

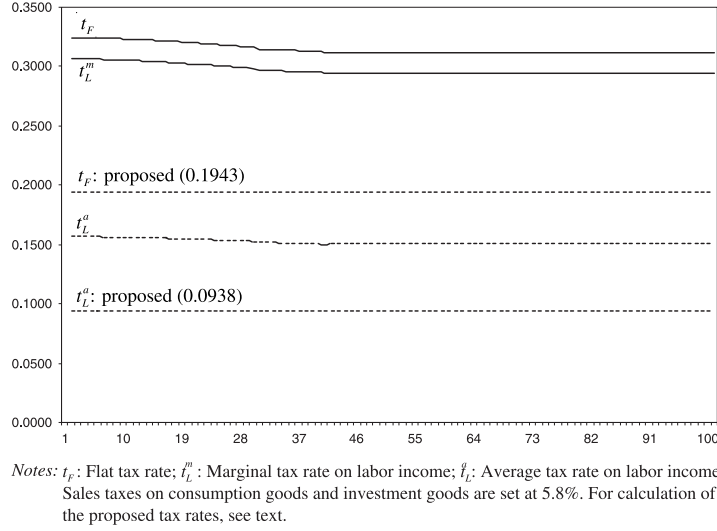


Figure 1b. Transition paths of tax rates: Flat taxes, Armey-Shelby.

Table 2 reports the welfare effects of the six plans for replacing the corporate and individual income taxes with an NRST and the two additional plans for replacing income taxes with a labor income tax. We present two sets of simulations—one with the sales tax on investment goods and the other without. First, note that the case without a sales tax on investment goods is more in the spirit of the NRST, which exempts sales of investment goods from taxation. Unsurprisingly, the cases with sales taxes on investment removed are generally more efficient than those with sales taxes unchanged ($t_I = 0.058$).

Second, in Plans 1 through 6 a sales tax is included as a part of the replacement tax policy, the tax parameters in Panel 3 of table 1, together with sales taxes on investment goods ($t_I = 0.058$ or $t_I = 0$), generate revenue surpluses and require either a negative lump sum tax or a decrease in tax rates. This explains the fact that welfare gains under the lump sum tax adjustment are lower than under other tax adjustments.¹⁴ Third, except for Plan 8 and possibly for Plan 6, the welfare gains are impressive. Plan

¹⁴Revenue shortfalls occur in Plan 7 with $t_I = 0$, and Plan 8 with either $t_I = 0.058$ or $TI = 0$.

Table 2a. Welfare effects of fundamental tax reform—Flat tax (billions of 1997 dollars)

Tax reform proposal and revenue adjustment	Welfare effect	
	$t_C = t_C^a = t_I = 0.058$	$t_C = t_C^a = t_I = 0$
1. <i>Hall-Rabushka</i>		
Lump sum tax	3637.3	4991.6
Flat tax	2056.2	814.9
Sales taxes	2582.2	—
Flat tax and sales taxes	2240.1	—
2. <i>Armey-Shelby</i>		
Lump sum tax	4173.0	5392.2
Flat tax	1229.3	-756.0
Sales taxes	2476.2	—
Flat tax and sales taxes	1772.7	—

Note: Inflation is fixed at 4% per year.

t_C : Marginal sales tax rate on consumption goods

t_C^a : Average sales tax rate on consumption goods

t_I : Flat sales tax rate on investment goods

4 with flat sales and labor income taxes and no tax on investment goods ($t_I = 0$) attains a welfare gain of \$4.70 trillion, more than five times the corresponding gain for the HR Flat Tax proposal. However, Plan 2 and Plan 7 are not far behind in terms of gains in welfare. Finally, the welfare gains attainable with the progressive Plans 1, 3, 5 are also much higher than those of the HR and AS Flat Tax proposals.

A second set of comparisons that is highly relevant to deliberations about tax reform is the cost of progressivity. One of the most attractive features of the HR and AS Flat Tax proposals is the possibility of introducing a system of family allowances in order to preserve the important function of the existing U.S. tax system in redistributing economic resources. Plan 1 for the NRST also retains this feature of the tax system, but generates welfare gains of \$3.32 trillion, exceeding those of the HR Flat Tax proposal by more than fifty percent. Of course, a sales tax can be employed to compensate for the revenue shortfall of the HR Flat Tax, reducing the difference between the welfare gains. However, the NRST is clearly superior to the Flat Tax as an approach to tax reform when both retain an element of progressivity.

The costs of progressivity can be ascertained by comparing the welfare gains between Plan 1, a progressive sales tax, with Plan 2, a flat sales tax.

Table 2b. Welfare effects of fundamental tax reform–National Retail Sales Tax
(billions of 1997 dollars)

Tax reform proposal and revenue adjustment	Welfare effect	
	$t_I = 0.058$	$t_I = 0$
1. <i>Progressive Sales, no Labor Income Tax</i>		
Lump sum tax	1830.1	2583.9
Labor income tax	–	–
Sales taxes	3268.5	3323.6
Labor income tax and sales taxes	–	–
2. <i>Flat Sales, no Labor Income Tax</i>		
Lump sum tax	3500.8	4115.6
Labor income tax	–	–
Sales taxes	4540.8	4686.8
Labor income tax and sales taxes	–	–
3. <i>Flat Sales Tax, Progressive Labor Income Tax</i>		
Lump sum tax	1924.0	2678.3
Labor income tax	3413.0	3086.9
Sales taxes	2686.1	2871.3
Labor income tax and sales taxes	2992.9	2965.8
4. <i>Flat Sales, Flat Labor Income Tax</i>		
Lump sum tax	3838.3	4427.8
Labor income tax	4504.9	4697.3
Sales taxes	4545.5	4696.5
Labor income tax and sales taxes	4530.8	4697.3
5. <i>Progressive Sales Tax, Flat Labor Income Tax</i>		
Lump sum tax	2965.1	3633.8
Labor income tax	3666.8	3868.9
Sales taxes	3888.8	3946.0
Labor income tax and sales taxes	3796.9	3910.1
6. <i>Progressive Sales Tax, Progressive Labor Income Tax</i>		
Lump sum tax	769.3	1609.3
Labor income tax	2233.3	1802.7
Sales taxes	1694.0	1737.5
Labor income tax and sales taxes	1921.3	1766.5
7. <i>No Sales, Flat Labor Income Tax</i>		
Lump sum tax	4106.1	4664.3
Labor income tax	4354.6	4527.8
Sales taxes	–	–
Labor income tax and sales taxes	–	–
8. <i>No Sales, Progressive Labor Tax</i>		
Lump sum tax	-1806.8	-818.2
Labor income tax	-2869.3	-4447.9
Sales taxes	–	–
Labor income tax and sales taxes	–	–

Note: Inflation is fixed at 4% per year.

t_I : Sales tax rate on investment goods

With no sales tax on investment goods and adjustment of the sales tax on consumption goods to achieve revenue neutrality, the gain in welfare from eliminating progressivity is \$1.36 trillion, added to the welfare gain of a progressive sales tax of \$3.32 trillion for an overall gain of \$4.69 trillion. Similar comparisons can be made between Plan 3 with a flat sales tax and a progressive labor income tax and Plan 4 with flat sales and labor income taxes. The welfare gains from eliminating progressivity are \$1.61 trillion when the labor income tax is used to achieve revenue neutrality and \$1.83 trillion when the sales tax is used for this purpose. Other comparisons between progressive and flat versions of the NRST given in table 2a generate estimates of the cost of progressivity that are similar in magnitude.

Since taxes distort resource allocation, a critical requirement for a fair comparison among alternative tax reform proposals is that all proposals must raise the same amount of revenue. It is well known that the ST and AFT sales tax proposals fail to achieve revenue neutrality and tax rates must be increased substantially above the levels proposed by the authors of the plans.¹⁵ The authors of the HR Flat Tax proposal have calibrated their tax rates to the National Income and Product Accounts for 1993 in such a way that the resulting tax regime is revenue neutral. It is clear that the AS proposal falls short of revenue neutrality because it is more generous in personal allowances and applies a lower tax rate than the HR proposal. As it turns out, however, the HR proposal also raises too little revenue to be neutral.

Based on the federal Flat Tax rate proposed by Hall and Rabushka, we have estimated three tax rates under the assumption that the state and local income taxes are also replaced by a Flat Tax. Specifically, we start with the Flat Tax rate $t_F = 0.2164$, the marginal tax rate on labor income $t_L^m = 0.2114$, and the average tax rate on labor income $t_L^a = 0.1202$ (see table 1). In order to meet the government sector revenue requirement, these tax rates must be increased by a factor of 0.27–0.33. It follows that the statutory federal Flat Tax rate must be increased from 19% to 24–25%. The problem is even more severe with the AS proposal, where the tax rates must be increased by a factor of 0.60–10.67 implying that the proposed federal Flat Tax rate must be increased from 17% to 27–28%.

The need for a major upward adjustment in the Flat Tax rate conflicts with the fact that in table 4 HR is originally designed to be revenue neutral. The explanation is that the data set employed by Hall and Rabushka, the

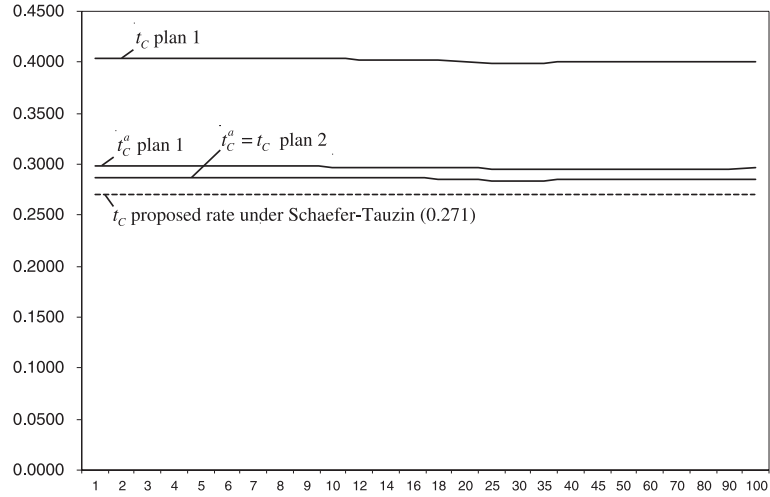
¹⁵For example, see Aaron and Gale (1996) and Gale (1999).

U.S. National Income and Product Accounts of 1993, was generated under a tax system with a significant tax burden on capital.¹⁶ Unsurprisingly, they found a large tax base in the business sector.¹⁷ Although the Flat Tax imposes a lump sum tax on “old” capital accumulated before the tax reform, the Flat Tax does not impose any tax burden on “new” capital accumulated through investment after the reform. The tax base of the business portion of the tax shrinks dramatically and a large revenue shortfall emerges, requiring an increase in the Flat Tax rate.

In figures 2a and 2b we represent the transition paths of the tax rates for four NRST plans with no sales tax on investment goods ($t_I = 0$)—Plans 1, 2, 4, and 5. In addition, we represent the transition paths of tax rates for plan 7. In order to make the plans revenue neutral, we adjust the sales tax rates of Plans 1 and 2 proportionally. For Plans 4 and 5, where the sales tax is combined with a flat labor income tax, the sales tax rate and the labor income tax rate are adjusted simultaneously and by the same proportion. For Plan 7, we adjust the labor income tax rates. In Plan 1, the closest to the ST version of the NRST, we find that the marginal tax rate must be raised to about 40% and the average tax rate to about 30%. By contrast, the sales tax rate proposed in ST is 15% on a tax-inclusive base, which is equivalent to 17.6% on a tax exclusive basis.

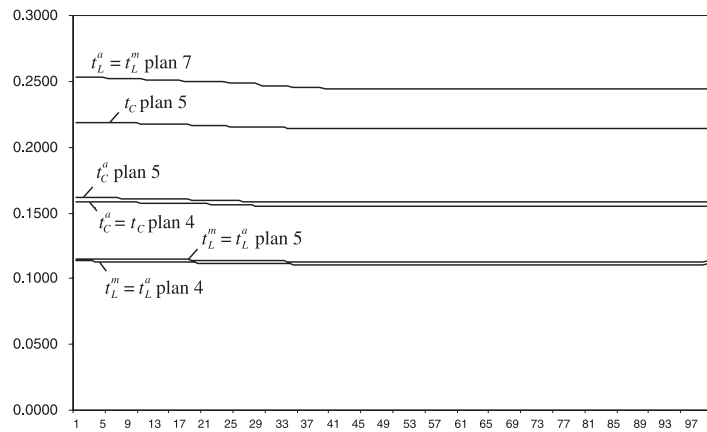
¹⁶In 1993, the corporate income taxes were \$138.3 billion for the Federal Government and \$26.9 billion for the state and local governments. In the same year, the Federal Government collected \$508.1 billion of income tax from individuals and the state and local governments collected \$124.2 billion.

¹⁷Starting from a GDP of \$6,374 billion, they estimated that the business tax base was \$1,903 billion and the wage tax base, \$1,395 billion dollars. See Hall and Rabushka (1995), p. 57.



Notes: t_C : marginal sales tax; t_C^a : average sales tax
 Plan 1: Progressive sales tax with no labor income tax.
 Plan 2: Flat sales tax with no labor income tax.
 The proposed marginal sales tax rate of 27.1% is obtained by adding the sales tax rate 5.8% of the 1996 tax system to the Schaefer-Tauzin sales tax rate of 21.3% intended to replace income taxes. We note however that the Schaefer-Tauzin proposal replaces estate and gift taxes and some excise taxes as well as income taxes.

Figure 2a. Transition paths of tax rates: Plans 1 and 2 of NRST.



Notes: t_C : marginal sales tax; t_C^a : average sales tax; t_L^a : average tax rate on labor income;
 t_L^m : marginal tax rate on labor income.
 Plan 4: flat sales tax and flat labor income tax.
 Plan 5: progressive sales tax and flat labor income tax.
 Plan 7: flat labor income tax with no sales tax.

Figure 2b. Transition paths of tax rates: Plans 4, 5, and 7 of NRST.

We take the 1996 composition of the corporate and individual income tax revenues as the benchmark. We then multiply the ST tax rate by the ratio of the income tax revenues of the federal, state, and local governments to the revenues of the federal government alone to obtain the ST tax rate for the government sector. In 1996, corporate income taxes were \$194.5 billion at the federal level and \$34.5 billion at the state and local level. In the same year, individual income taxes were \$666.7 billion at the federal level and \$149.1 billion at the state and local level. We multiply the ST tax rate by 1.213 to obtain 21.3% ($= 17.6 * 1.213$) as the ST tax rate for the government sector on a tax-exclusive basis. We find that the ST tax rate is only about half the rate required for revenue neutrality. It is also lower than the revenue neutral average tax rates of Plan 1 and Plan 2 reported in table 8.4, suggesting strongly that the ST proposal falls far short of revenue neutrality.

Sales tax rates decline slowly with time, reflecting the fact that capital stock grows in response to the elimination of income taxes on capital, raising output and, ultimately, consumption. We also note that the tax rate of Plan 2 is lower than the average tax rate of Plan 1 by about one percentage point, reflecting the greater efficiency of Plan 2. If the revenue-raising role is shared between the sales tax and the flat labor income tax, the required marginal sales tax rate is 15.5–15.9% for Plan 4 and 15.8–16.1 for Plan 5. The required average tax rate on labor income t_L^a , which is equal to the required marginal tax rate t_L^m , is 11.1–11.3% in Plan 4, and 11.3–11.5% in Plan 5.

5. Conclusion

Our final objective is to evaluate the cost of capital as a practical guide to reform of taxation and government spending. Our primary focus is U.S. tax policy, since the cost of capital has been used much more extensively in the U.S. than other countries. Auerbach and Jorgenson (1980) introduced the key concept, the marginal effective tax rate, early in the debate over the U.S. Economic Recovery Tax Act of 1981. They showed that the tax policy changes of the early 1980s, especially the 1981 Tax Act, increased barriers to efficient allocation of capital.

By contrast we showed that the Tax Reform Act of 1986 substantially reduced barriers to efficiency.¹⁸ The erosion of the income tax base to provide incentives for investment and saving was arrested through vigorous and far-reaching reforms. Incentives were sharply curtailed and efforts were made

¹⁸Jorgenson and Yun (1990) and Yun (2000).

to equalize marginal effective tax rates among assets. The shift toward expenditure and away from income as a tax base was reversed. Jorgenson's international comparisons of 1993 showed that these reforms had important parallels in other industrialized countries.

The cost of capital approach has also proved its usefulness in pointing the direction for future tax reforms. For this purpose information about the cost of capital must be combined with estimates of the substitutability among different types of outputs and inputs by businesses and households. During the 1990s, tax reformers have renewed their interest in replacing income by consumption as the basis for taxation. We have shown that the most popular Flat Tax proposals for achieving this objective would generate substantial welfare benefits. However, a National Retail Sales Tax would produce benefits that are fifty percent higher! The cost of maintaining a progressive rate structure within the framework of the National Retail Sales Tax is very large. The benefits of a National Retail Sales Tax with a flat rate structure are double those of a Flat Tax .

Our overall conclusion is that the cost of capital and the closely related concept of the marginal effective tax rate have provided an important intellectual impetus for tax reform. The new frontier for analysis of tax and spending programs is to combine the cost of capital and the marginal effective tax rate with estimates of substitution possibilities by businesses and households. This combination makes it possible to evaluate alternative tax reforms programs in terms of economic welfare. We have illustrated this approach for a variety of fundamental tax reforms. Our hope is that these illustrations will serve as an inspiration and a guide for policy makers who share our goal of making the allocation of capital within a market economy more efficient.

References

- Aaron, Henry J. and William B. Gale (eds.). 1996. *Economic Effects of Fundamental Tax Reform*, Washington, D.C.: The Brookings Institution.
- Aaron, Henry J., William B. Gale, and James Sly. 1999. The Rocky Road to Tax Reform. In *Setting National Priorities—The 2000 Election and Beyond*, eds. Henry J. Aaron and Robert D. Reischauer, 211–266. Washington, D.C.: The Brookings Institution.
- Auerbach, Alan J. and Dale W. Jorgenson. 1980. Inflation-Proof Depreciation of Assets. *Harvard Business Review* 58, no. 5 (September-October): 113–118.
- Birnbaum, Jeffrey H. and Alan S. Murray. 1987. *Showdown at Gucci Gulch*. New York: Random House.

Bradford, David F. 2000. *Taxation, Wealth, and Saving*, Cambridge, MA: The MIT Press. Mass.

_____. 1986. *Untangling the Income Tax*. Cambridge, MA: Harvard University Press.

Engen, Eric and William Gale. 1997. Macroeconomic Effects of Fundamental Tax Reform: Simulations with a Stochastic Life-Cycle, Overlapping Generations, General Equilibrium Model. In *Joint Committee on Taxation, Tax Modeling Project and 1997 Tax Symposium Paper*, Washington, DC: U.S. Government Printing Office (November): 101–129.

Feenberg, Daniel R., Andrew W. Mitrusi, and James M. Poterba. 1997. Distributional Effects of Adopting a National Retail Sales Tax. In *Tax Policy and the Economy*, vol. 11, 49–89, ed. James M. Poterba. Cambridge, MA: MIT Press.

Fox, William F. and Matthew N. Murray. 1997. The Sales Tax and Electronic Commerce: So What's New? *National Tax Journal*, vol. 50, no. 3 (September): 573–592.

Fullerton, Don and Diane Lim Rogers. 1996. Lifetime Effects of Fundamental Tax Reform. In *Economic Effects of Fundamental Tax Reform*, eds. Henry Aaron and William B. Gale 321–352. Washington, DC: Brookings Institution.

_____. 1997. Neglected Effects on the Uses Side: Even a Uniform Tax Would Change Relative Goods Prices. *American Economic Review* 87, no. 2 (May): 120–125.

Gale, William G. 1999. The Required Tax Rate in a National Retail Sales Tax. *National Tax Journal* 52, no. 3 (September): 443–457.

Gentry, William M. and R. Glenn Hubbard. 1997. Distributional Implications of Introducing a Broad-based Consumption Tax. In *Tax Policy and the Economy*, ed. James M. Poterba, vol. 11, 1–47, Cambridge, MA: MIT Press.

Gravelle, Jane G. 1995. The Flat Tax and Other Proposals: Who will Bear the Tax Burden? CRS Report for Congress, Congressional Research Service, November 1995.

Hall, Robert E. 1996. The Effects of Tax Reform on Prices and Assets. In *Tax Policy and the Economy*, ed. James M. Poterba, vol. 10, 71–88, Cambridge, MA: MIT Press.

_____. 1997. Potential Disruption from the Move to a Consumption Tax. *American Economic Review* 87, no. 2 (May): 147–150.

Hall, Robert E., and Alvin Rabushka. 1983. *Low Tax, Simple Tax, Fair Tax*, McGraw Hill.

_____. 1995. *The Flat Tax*, 2nd ed., Stanford, CA: Hoover Institution Press.

Harberger, Arnold C. 1962. The Incidence of the Corporation Tax. *Journal of Political Economy* 70, no. 3 (June): 215–240.

- _____. 1966. Efficiency Effects of Taxes on Income from Capital. In *Effects of the Corporation Income Tax*, ed. Marian Krzyzaniak, 107–117. Detroit, MI: Wayne State University Press.
- Hellerstein, Walter. 1997. Transaction Taxes and Electronic Commerce: Designing State Taxes that Works in an Interstate Environment? *National Tax Journal* 50, no. 3 (September): 593–606.
- Ho, Mun S. and Kevin J. Stiroh. 1998. Revenue, Progressivity, and the Flat Tax, *Contemporary Economic Policy* 45, no. 1 (January): 85–97.
- Jorgenson, Dale W. 1963. Capital Theory and Investment Behavior. *American Economic Review* 53, no. 2 (May): 347–259.
- _____. 1966. The Embodiment Hypothesis. *Journal of Political Economy* 74, no. 1 (February): 1–17.
- Jorgenson, Dale W., and Kun-Young Yun. 1990. Tax Reform and U.S. Economic Growth. *Journal of Political Economy* 98, no. 5, part 2 (October): S151–193.
- _____. 2001. *Lifting the Burden*, MIT Press, Cambridge, MA (in press).
- King, Mervin A., and Don Fullerton (eds.). 1984. *The Taxation of Income from Capital: A Comparative Study of the U.S., U.K., Sweden, and West Germany*. Chicago: University of Chicago Press.
- Lodin, Sven-Olof. 1978. *Progressive Expenditure Tax—An Alternative?* Stockholm: LiberForlag.
- Meade, James Edward. 1978. *The Structure and Reform of Direct Taxation: Report of a Committee Chaired by Professor James Edward Meade*. London: Allen and Unwin.
- Mikesell, John L. 1997. The American Retail Sales Tax: Considerations on their Structure, Operations and Potential as a Foundation for a Federal Sales Tax, *National Tax Journal* 50, no. 1 (March): 149–165.
- McLure, Charles E., Jr. 1993. Economic, Administrative, and Political Factors in Choosing a General Consumption Tax, *National Tax Journal* 46, no. 3 (September): 345–358.
- Murray, Matthew N. 1997. Would Tax Evasion and Tax Avoidance Undermine a National Sales Tax? *National Tax Journal* 50, no. 1 (March): 167–182.
- Poddar, Satya and Morley English. 1997. Taxation of Financial Service Under a Value-Added Tax: Applying the Cash-Flow Approach. *National Tax Journal* 50, no. 1 (March): 89–111.
- Sakar, Shounak and George R. Zodrow. 1993. Transitional Issues in Moving to a Direct Consumption Tax, *National Tax Journal* 46, no. 3 (September): 359–376.
- Schaefer, Dan *et al.* 1997. National Retail Sales Tax Act of 1996, H.R.3039 Introduced in the 104-th Congress, March 6, 1996. Also National Retail Sales Tax Act of 1997, H.R.2001 Introduced in the 105-th Congress, June 19, 1997.

U.S. Department of the Treasury. 1977. Blueprints for Basic Tax Reform.

U.S. Department of the Treasury. 1984. *Tax Reform for Simplicity, Fairness, and Economic Growth*, 3 vols., Washington, DC: U.S. Government Printing Office.

Yun, Kun-Young. 2000. The Cost of Capital and Intertemporal General Equilibrium Modeling of Tax Policy Effects. In *Econometrics: Econometrics and the Cost of Capital*, ed. Lawrence J. Lau, vol. 1, 227–272, Cambridge, Massachusetts: The MIT Press.

Zodrow, George R. 1999. The Sales Tax, the VAT, and Taxes in Between—Or, is the Only Good NRST a VAT in Drag? *National Tax Journal* 52, no. 3 (September): 429–442.

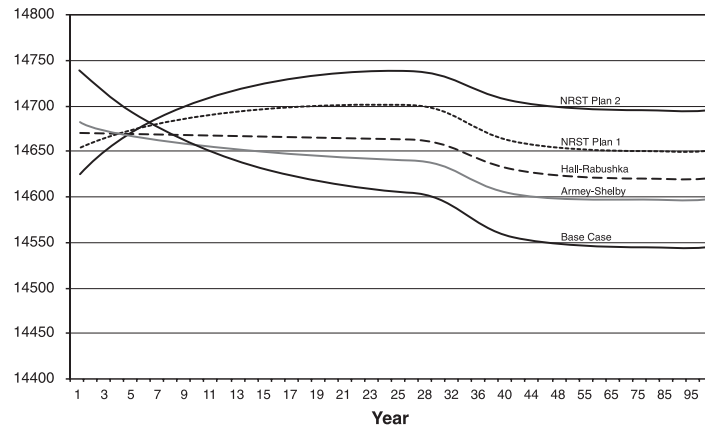


Figure A.1. Dynamic paths of full consumption (billions of units).

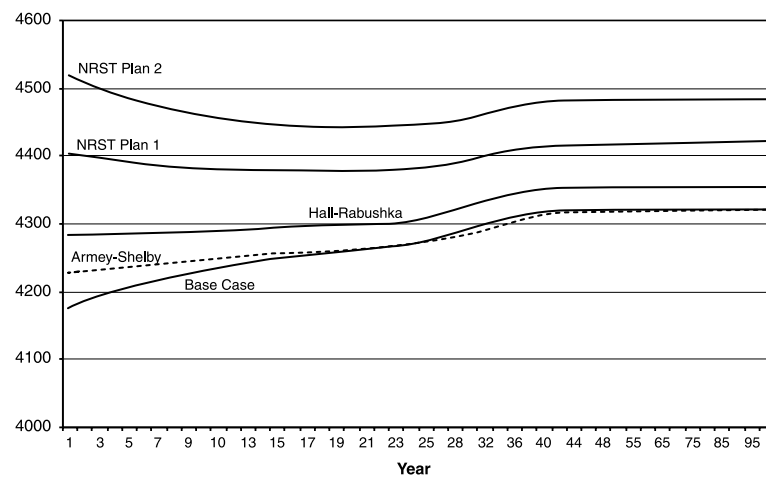


Figure A.2. Dynamic paths of labor supply (billions of units).

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