ON THE EFFICIENCY COST OF REDISTRIBUTION

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Abstract: On the Efficiency Cost of Redistribution

The efficiency cost of redistribution depends on what taxes are imposed to raise the amounts involved. In an imperfect tax system where not all taxes have the same marginal cost, it is possible to find a low-cost tax and even to devise a tax increase that offsets pre-existing distortions. In this latter case, the efficiency cost of redistribution can be negative. The point is illustrated using a new multi-sector, open-economy model of the United States to simulate the use of various taxes to fund increases in federal transfer payments. The efficiency costs of some redistributions are found to be three percent or less of the amounts involved.

ON THE EFFICIENCY COST OF REDISTRIBUTION

If taxes are used to finance a transfer to the poor, the tax-distortions of market prices make the cost of the transfer exceed the amount transferred. This excess is an efficiency cost of redistribution estimated by various authors, most notably Browning and Johnson [5] and Ballard [3]. Their estimates were obtained from simulations with one-sector, closed-economy models where the efficiency cost arises from income-tax distortions of labor supply. These costs are surprisingly large, even when modest labor-supply elasticities are assumed.

Ballard noted that the very high costs found by Browning and Johnson could not be reproduced but turned out significantly lower when a well-specified general equilibrium model was used to estimate them. His suggestion that one extend the analysis by considering different types of tax instruments in a more elaborate model is taken up in this paper where I use a multi-sector, open-economy model. In such a model, a sales-tax, for example, can distort choices of consumption goods and saving whereas in a one-sector model the sales tax is indistinguishable from a flat income tax. Openness of the model to foreign trade allows the incidence of a tax to fall on non-residents and can thus moderate the national cost of taxes and income redistribution. Considerations of this type recommend the use of a more elaborate model for measurement of the cost of redistributing revenues raised with taxes other than the one on individual income. The main motivation for trying other taxes as sources of redistributed funds is that one should not regard the cost of redistribution as anything but the cheapest possible one. To regard the cost of income-tax redistribution as the cost of redistribution can be like saying that limousine rental is the cost of commuting to downtown in a town where the bus fare is only one dollar. The cost of redistributing income-tax revenues would be representative if we knew that the tax system is one where all taxes from all sources have the same marginal cost in all their uses, which of course they do not have.

The findings corroborate Ballard's statement that completion of a model's specification reduces the estimated welfare cost and support Harberger's opinion that "while the most eminent minds in the economics profession would be hard put to find ways of effectuating quantitatively important transfers at efficiency costs of less than one percent of the amounts involved, most beginning graduate students could in one afternoon invent a hundred ways of bringing about major transfers at an efficiency cost of less than 20 percent of the amounts involved." [7, p. 115].

THE MODEL

The model is a multi-sector, multi-household model with two levels of government and open to foreign trade in goods and capital services. The structure of the model and its equations are documented in DIA [6]. The description of the model can therefore be kept brief in this paper.

Industrial sectors employ capital and labor to produce goods that compete with imports. Output is demanded for intermediate use by producers and for final use by households, government, and for export. Intermediate use is in fixed proportions to gross output. Inputs of domestic and foreign origins are not substitutable. Besides consumption categories, households demand also leisure and a capital good that represents their net saving. Gross investment includes capital replacement and inventory accumulation in addition to household saving. Each industrial sector's capital cost allowance is in fixed proportion to the capital services employed by the sector and spent on gross fixed capital formation categories. The proportion is fixed in terms of quantities of new capital goods per unit of capital input but varies across industries. In this way, depreciation is added to the cost of capital and deducted from taxable profits. Inventory accumulation is modeled as a use of aggregate, undistributed profits. The income from a fraction of aggregate industrial capital is applied to the purchase of an inventory good. All final demand categories for consumption, fixed capital formation, inventory accumulation and government use are linear combinations of composites of domestic and foreign products. The elements in these linear combinations are Armington [1] functions of imports and domestic industry output.

Value-added production functions have constant returns to scale and constant elasticities of substitution (Cobb-Douglas or CES). Household utility is a three-level nested CES function with consumption goods and services in the lower nest, the lower nest and leisure in the middle, and present and future consumption in the overall CES functions. The demand functions derived from this utility function are for goods and services, leisure, and saving. The utility and demand functions are identical to those in Ballard, Fullerton, Shoven and Whalley [4] in almost every respect. The only difference is that the CES form is employed at all three nesting levels.

Following Krauss and Johnson [8] I postulate a "government utility" but rather than a single level of government, the model has two: the federal and the State/Local. The government utility functions are CES in two categories each, without nesting. The federal expenditure categories are Defense and Non-Defense. The State/Local expenditure categories are Education and "Other State/Local Expenditure."

Government expenditures are financed by taxes and inter-government transfers. Inter-government transfers are one-way, from the federal to the State/Local. Both levels of government make transfers to households. These transfers are treated as non-taxable.

Taxes fall on industry payrolls, profits, property, and output. The output tax is an origin-based indirect tax minus subsidies. The property tax is not modeled as an indirect one but as a tax on capital services to industry. Household purchases are subject to sales tax. Household saving, intermediate input demands and government purchases can be excluded from the sales tax base. Imports are subject to duty. A household's personal income tax liability is a polynomial function of its taxable income. Taxable income equals factor payments accrued less a deduction for saving and excludes undistributed capital income. The return to the homeowners' equity in their homes is one part of capital income not distributed by the Real Estate industry. Use of a polynomial to model income tax liability causes the marginal tax rate to be endogenous.

Payroll, profits, sales and personal income taxes are modeled separately for the federal and the State/Local levels of government. The output and property taxes are reserved to the State/Local level. The import duty is reserved for the federal level of government.

The model is closed with foreign demands for US exports. These demands are functions of the relative export price only. The relative export price is the ratio of the US basic price over an exogenous world market price converted to US dollars. Basic prices are industry selling prices covering input costs and the indirect output tax and exclude other indirect tax margins. The output of a "Rest-of-the world" sector is included among the traded goods. This output represents net foreign capital income obtained as the difference between a foreign demand for the services of US capital and a US demand for the services of foreign capital. Two-way trade in capital services is thus included in the current account. The import goods include also non-competing imports employed in fixed proportions as intermediate inputs to production and as input to final demand categories. Import prices are fixed in foreign currency.

DATA, AGGREGATION, AND CALIBRATION

The data source is the GEMODEL.USA sample data files. Primary data sources for these files were the 1977 US benchmark input-output tables [10], BLS Family Expenditure Surveys [13], Census Bureau Current Population Reports [11], the National Accounts [12], IRS statistics of income and income taxes [14], and a special tabulation of indirect tax margins and import duties by commodity produced by the Bureau of Economic Analysis. Property taxes paid by sector were estimated using the input-output and national accounts data on file [6, page 4-46].

The input-output data include not only the Use matrix but also the Make matrix, the Input-Output Composition of Personal Consumption Expenditures, and a Capital Formation Table by Gerald Silverstein [9]. This latter table is used to disaggregate gross fixed capital formation into net saving and capital replacement, and to compute capital-good demand coefficients by industry and by commodity.

Production and tax data are processed at the 85-industry, 85-commodity level of the 1977 benchmark input-output table. Household data are for quintiles of income distribution. The 1977 national accounts and input-output tables form a core of data to which the later household consumption expenditure data are adjusted for consistency with control totals. The model is thus calibrated for a 1977 base case and running it through without policy or parameter changes reproduces the 1977 outputs, input uses, and tax collections by source as published in the primary data sources.

The 85-industry detail cannot be retained for simulation purposes. The data are aggregated to one-sector and 14-sector models with two levels of government in both cases. Eighty-three personal consumption expenditure categories are aggregated to 13 in the 14-sector model. Households remain in quintiles of the money-income distribution, as in [5]. The aggregated data are then used to calibrate function parameters to elasticity assumptions.

For capital-labor substitution in the one-sector model I adopt the value of .8 assumed by Ballard [3]. For the 14-sector model I adopt values similar to those used by Ballard *et al.* [4], namely less than one in Agriculture, Forestry, Fishing and Manufacturing, and unity elsewhere. Elasticities of substitution in consumption are assumed to be .8 for household consumption and .5 for government consumption. Elasticities of substitution for leisure and saving are picked in iterative procedures so that the implied elasticities of labor supply and savings are .2 and .4, respectively. For the upper quintile the iterations do not converge in less than 10 iterations unless a negative labor supply elasticity is allowed and so I chose a substitution elasticity that results in a backward bending labor supply with elasticity equal to -.2. As in [4], the modeling of saving requires an assumption about the price-earnings ratio of capital and I follow Ballard et al. in assuming 25 years purchase or a four percent real rate of return.

The calibration routines fit personal tax liabilities to a fourth-degree polynomial function of taxable income. The polynomial coefficients imply marginal federal tax rates on labor income that range from 11.8 percent to 38.7 percent. State tax rates range from 1.3. to 4 percent. The taxable income computation requires assumptions about the deductibility of pension saving and the exclusion of accrued capital income. National accounts data suggest that undistributed profits and homeowners' equity income represent about one-half of aggregate income of capital after depreciation and profits taxes. Accordingly, I compute taxable income with a 50 percent exclusion of capital income. As for saving, I simply assume that ten percent of household saving is deductible. Recall that inventory accumulation is excluded from household income and that most of gross fixed capital formation is also excluded by treating it as a capital consumption allowance spent on capital goods.

Export demand elasticities by commodity are from Baldwin [2]. The model's aggregation routines are used to aggregate commodities and elasticities, as well as to convert them to price elasticities of demand for aggregated industry products [6, pp. 4-22]. Armington elasticities of substitution of imports for domestic products in final demand are chosen so that the model's elasticities of demand for imports for final and intermediate use approximate Baldwin's import demand elasticities as closely as possible. These and the other elasticity assumptions are included in GEMODEL.USA's Test.USB sample file.[1]

Calibration is completed with computation of ad-valorem commodity and factor tax rates. Factor tax rates are simply ratios of tax revenues over factor incomes excluding taxes. The computation of commodity tax rates is more complicated [6, pp. 2-20, 5-18, 5-19]. A vector of import duty revenues by commodity is multiplied by a market share matrix to convert it to duty revenues by industry product and then aggregated to 1- or 14-sector levels. Vectors of federal and State/Local sales tax revenues by commodity are divided by sales tax bases to obtain commodity tax rates. These rates, multiplied by matrices of commodity transactions yield the cells in two input-output tables of federal and State/Local sales taxes on intermediate and final input-output transactions. The input-output sales tax tables are then converted from their industry-and-category-by-commodity dimension to the model's industry-and-category-by-industry dimension and aggregated. Division of cells in these new tables by corresponding cells in the model's use table yields federal and State/Local sales tax rates by product type and use. Much depends in these computations on how the tax base is defined. The federal excise tax is treated as a destination-based turnover tax. The State/Local tax is treated as a destination-based retail sales tax on GNP excluding inventory accumulation, that is without deduction for gross fixed capital formation.

THE SIMULATION EXPERIMENTS

The redistributions involve (1) a demogrant and (2) a poverty relief program consisting of a grant to the lowest quintile; both financed by an increase in one of the federal taxes. The amount transferred to households is one percent of total federal tax revenue. A larger redistribution is also simulated. The rate for the tax chosen to finance the redistribution is adjusted to produce the required revenue increase. State tax rates are left undisturbed. Federal transfers to State/Local governments are held constant, and so is the real value of federal expenditure deflated by the GNP price index. A reference point from which to judge the distortions caused by redistribution is provided by the results of income-tax-financed redistributions. These may be compared to those obtained by previous authors. One-sector simulations were made to facilitate that comparison.

The choice of alternative sources of finance is aided by computation of marginal costs of taxes. These are found to vary greatly from one tax base to another. They range from negative to 80

[1] All references to GEMODEL.USA should be taken as references to GEMODEL.PRO, the updated version of the former.

percent of additional tax revenues.[2] A low-cost tax is then chosen to redo the redistribution at the 14-sector level of aggregation.

Welfare changes are measured in Hicksian equivalent variations. The value of changes in leisure and saving is included in the measure of welfare change.

Leisure is valued at the net wage after deductions of the marginal rates of federal and state individual income tax. The utility of saving in the static model is that of the increase in annual consumption obtained by saving. The gains from terms-of-trade improvement are measured by what the trade deficit would be in the new situation if import and export prices had remained as they were in the old situation. The trade deficit is, of course, zero in the equilibrium solution for the new situation.

Administration costs of welfare programs, the programs' effect on family structure and location, program-induced non-linearities in budget constraints, and the role of redistribution as social insurance in the face of uncertainty are abstracted from the model and not dealt with in the simulations. These other issues can be left aside while discussing, as we do here, the alternative costs of a transfer given some stylized labor-supply behavior and an imperfect tax system.

RESULTS FROM THE STATIC MODEL

Table 1 shows results of the two redistributions using the individual income tax as the source of finance. The coefficients of the federal income tax polynomial are here all increased by the same percentage, without changing the savings deduction and capital income exclusion. As in [3], the efficiency cost of a poverty-relief program that redistributes only to the lowest quintile is less than the cost of a demogrant that makes equal gifts to all income groups. Moreover, efficiency costs have again been reduced by fuller specification of the model. Note, especially, that disaggregation of industry production and final demand reduces the measured efficiency cost. The main reason for this is that personal outlays shift away from lightly taxed goods and services preferred by high-income households (personal business consumption, saving) to more heavily taxed goods and services preferred by low-income households (beverages and tobacco). The shift in final demands lengthens the base of Harberger rectangles. This beneficial effect of redistribution is a clue that may be given to a graduate student asked to find a low-cost source of funds: Do not touch the federal excise tax on personal consumption. This tax (on line 10 of Table 2) has a greater than average marginal efficiency cost (on line 12). Large welfare cost triangles could be created by using it whereas not using it creates rectangles of welfare gain.

The marginal costs of taxes were computed to better inform the choice of taxes to be used to fund transfer programs (Table 2). The measure of marginal cost is the static efficiency cost per dollar of additional revenue spent by government on goods, services and transfers according to base case propensities and elasticities. Revenue increases are achieved by equiproportional increases in tax rates on a particular base. Simulations were made for each level of government and every one

[2] The negative efficiency cost of the non-resident withholding arises because the tax reduces capital tax differentials. Model calibration assumed that capital services are traded free of tax. If true, this would distort the allocation of capital between taxed domestic sectors and the untaxed Rest-of-the-world sector. That result can be avoided by adding revenue from non-resident withholding tax to the GEMODEL.USA data base as duty on imports of the Rest of the World's product.

of its bases. When computing the marginal cost of taxes imposed by one level of government, the tax rates of the other are left undisturbed so that its revenue may rise or fall depending on how taxes at the two levels interact. The denominator in the marginal cost ratio is thus the change in total revenue at both levels, subject to revenue increasing by one percent at the level of government whose tax rates change. Revenue changes are made real by holding the GNP deflator constant.

Differences between national- and efficiency-costs in Table 2 are due to terms-of-trade changes. Non-residents suffer some of the incidence of a tax whenever the efficiency cost exceeds the national cost. Taxes that depress the US rental rate of capital are a boon to non-resident importers of US capital services.

The cost of the State/Local payroll tax (line 1) is negative because government is the only sector assumed to pay this tax and because this tax makes government face the cum-tax, distorted cost of its main primary input. This view of a payroll tax as a somewhat corrective one provides another clue to cheap redistributions.

The federal tax on intermediate inputs could be a low-cost source of funds (line 6). Because of fixed input coefficients, this tax is equivalent to an origin-based indirect tax on industry output and could be shown on the same line of Table 2 as the State/Local output tax (line 5). The fact that the State/Local tax has a higher marginal cost suggests that a federal output tax would not be a good choice, after all. It is imposed at comparatively low rates, produces little revenue, and would have to be increased many times over to yield appreciable sums for redistribution. If that were done, we could no longer be sure that it has a low marginal cost but should expect it to have the higher cost of the State/Local output tax. This leaves the federal tax on labor as our choice of a low-cost tax imposed on a large base.

Table 3 shows the welfare costs of redistributions of increased federal payroll tax revenues. Here we again redistribute an amount equal to one percent of federal tax revenue as either a demogrant or a grant for relief to the poorest fifth of the population. Computations were made using the 14-sector model.

Recalling that Harberger's faith in students is such that he trusts them to devise major transfers I try also a larger redistribution to the lowest quintile of an amount equal to ten percent of federal tax revenues, collected by increasing the federal payroll tax. The marginal efficiency cost of this larger redistribution is not 3.5 cents per dollar but only 3 cents. Neglecting the burden of the program on non-residents, the excess cost imposed on the US is only 1.1 cents. The reason why the larger redistribution has the lesser excess burden must be that the labor tax undoes some of the profits tax distortion of the relative price of primary factors faced by industry. The revenue requirements of the larger redistribution raise labor tax rates to the double-digit level of pre-existing capital tax rates. At this level the labor tax can begin to offset the capital tax although it would never do so completely unless it had the same inter-industry differentials.

Further exploration of inefficient taxes can lead to the discovery of poverty-relief programs that have a negative marginal efficiency cost. A promising route is one that steps towards equalized marginal costs of taxes. For instance, if we depart from the single-tax approach to poverty relief, the last-discussed program can be bolstered with a twenty percent cut in corporate income tax rates (the model's profits or capital tax rates). Making the revenue loss up by a further increase in federal payroll taxes, the efficiency cost of a grant of ten percent of total federal tax revenue to the first quintile is 3.1 cents per dollar distributed (-6.4 cents of national cost). Ballard [3] obtained a similar result by a different route. He found a negative efficiency cost for an income-tax financed wage subsidy in aid of the working poor. His wage subsidy corrects the wrong labor-supply incentives provided by the income tax or by my payroll tax but it compounds the distortion of industrial factor proportions caused by the corporate income tax. Model specification, data and parameter assumptions determine which of these two effects predominates but the conflict does not arise in a one-sector model where "capital tax rates have no first-order distortionary effect" [3, pg. 1022]. I leave it to further research to find efficient combinations of wage subsidies to persons with payroll taxes on firms. For now, I am not surprised that "we do not observe [even more] wage subsidies." [3, p. 1031].

DYNAMIC RESULTS

Capital taxes distort not only the choice of factor proportions employed in production but also the consumers' choice between present and future consumption. This additional distortion can make a policy change expensive over time even if it appeared cheap in a static simulation experiment. Two experiments were therefore re-run through 100-year sequences of equilibria to compute present values of welfare change over time. Computation of the dynamic gains requires a comparison of a reference growth path that would be followed by the economy in the absence of a policy change with the path followed after a policy change. Welfare levels achieved along the path are measured without inclusion of the savings good in the utility function. The dynamic utility function consists of only the two lower levels of the three-level nested function. As in [4], the simulation of savings behavior assumes that households are guided by myopic expectations.

The reference path is obtained by adding a household's current saving to its capital endowment for the following year and then solving for that next year's equilibrium. The rate of growth of the capital stock is thus endogenous. Assuming steady-state growth, the population in every income group is increased at the same rate as aggregate capital. The rate of growth of capital determines also the rate of growth of the foreign sector. While on the reference path, foreign demands for U.S. exports (including exports of capital services) are assumed to grow at the same rate as U.S.-owned capital and labor. U.S. imports of foreign capital services are shifted in proportion to the previous year's capital inflow. The first year's inflow is determined from the input-output use table as the amount that would have had to flow in on capital account to balance the deficit on current account. This autonomous capital inflow is also increased year-by-year at the rate of growth for the year to fully implement the assumption that foreign economies grow at the reference rate. Initially, all prices are equal to 1.0, and success with the simulation of the reference path is shown by the fact that they remain very near 1.0 over the whole 100-year period.

A new sequence of equilibria is computed after a policy change. Capital accumulation remains endogenous in this new sequence but the rates of growth of population, foreign demand for exports, and inflows of foreign capital are deemed exogenous and set equal to those in the reference solution. These rates are not constant from year to year but rise from 1.6 percent in the first year to 2.5 percent in the hundredth year. Population could be simulated as growing at lower rates by assuming that the reference growth rate of capital equals a sum of the biological rate of growth plus a labor-augmenting rate of technical progress. This alternative is not used so that we may contemplate the dynamic effect of tax and transfer changes in isolation from the redistribution of productivity gains. Recall that the marginal rates of individual income tax are endogenous and likely to be increased by labor-augmenting technical change.

The policies chosen for dynamic simulation are again a one percent increase in federal tax revenue for redistribution as a demogrant or as a grant in relief of the lowest quintile, both financed by an increase in federal payroll taxes. Parameter changes are made only at time zero, when the labor tax rate is increased and the households' and governments' shares in tax revenue are adjusted to effect the increased transfer. One cannot infer from this that the poor will indeed get more transfers in all 100 years. It is possible that the policy change depresses future tax revenue and thereby also future transfers to people entitled not to a fixed transfer but to an increased share in falling tax revenue. The actual result is that tax revenue per capita hardly changes so that the ratios of revised over base case transfer payments are virtually the same in year 100 as at time 0.

As might be expected, the present value of welfare changes is negative. The size of the losses depends on the discount rate used. I have used two alternative rates. One is the four percent real rate of return assumed in calibration; the other is the annual rate of growth. In both cases, the present value calculation includes a terminal adjustment for gains beyond the hundredth year. The terminal adjustment is the value of a consol with coupon equal to the last year's gain.

The dynamic computations confirm one static model result, namely that the demogrant is the more expensive program. It is more expensive mainly because losses set in at time zero, whereas the losses from the poor-relief program are deferred to the eighth period. The initial gains under the relief program are not enough to eliminate the present value of losses to those living in the initial period. In percent of base case GNP ($1976.577 billion), the losses range from .09 to 4.8. The first figure represents the national loss suffered by the currently living under the relief program, discounting at four percent. The higher figure represents the efficiency loss suffered by all generations under the demogrant, discounting at the rates of growth. Discounting at four percent, the present value of efficiency losses to all generations from the relief program is $17.25 billions. Converted to a perpetual annuity, this amounts to a figure 4.66 times as large as the corresponding one in Table 3. In the demogrant case, the ratio of dynamic over static efficiency losses is 2.9. Dynamic losses are thus the relatively important ones but may still not be considered large, given that the corresponding static losses are so small.

CONCLUSION

The efficiency cost of redistribution depends on the choice of tax base and tax rates made to raise the redistributed revenue. In a tax system where not every tax has the same marginal cost, it is always possible to find a lower-cost tax to pay for additional expenditures and transfers. Furthermore, if the initial tax system is very distorting, it may be possible to devise tax increases that offset pre-existing distortions. Thus it can be misleading to single out a particular source of tax finance and attribute the cost of redistribution to the peculiarly high cost of using that source. The cost of redistribution should be measured taking a reformed tax system as the starting point, one where all taxes have the same marginal cost or, failing that, assuming a simultaneous increase in all taxes at the government's disposal. Inclusion of more and less distorting taxes in this last exercise will change the computed cost away from previously reported figures. If the alternative of arbitrarily selecting a tax as the source of redistributed funds were to remain acceptable, the choice can be made so as to satisfy Harberger's expectation of the most eminent minds: the efficiency cost of a major redistribution can be brought close to one percent of the amount involved, at least in terms of its static national cost.

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[14] U.S. Department of the Treasury, Internal Revenue Service, 1977 *Statistics of Income, Corporation Income Tax Returns*, publication 16 (12-81), table 2.

Table 1: Gains and Losses from Income-Tax Revenue Redistribution

Experiment:		Welfare Cost		Cost to Losers per dollar gained by Gainers		Gain to the lowest income quintile
		National Cost	Efficiency Cost	National Cost	Efficiency Cost	
		(*a*)	(*b*)	(*a*)	(*c*)	
		($ billions)		(in $ per $		($ billions)
Demogrant	1	1.160	1.293	1.469	1.533	1.147
	14	0.895	0.999	1.349	1.390	1.183
Relief	1	0.932	1.080	1.224	1.260	4.161
	14	0.693	0.799	1.116	1.190	4.196

(*a*) includes terms-of-trade gains.

(*b*) excludes terms-of-trade gains.

(*c*) including non-residents among the losers.

Source: Author's calculations using GEMODEL.USA in 1- and 14-sector versions.

Table 2: Marginal Costs of Taxes						
			National Cost		Efficiency Cost	
			Sate/Local	Federal	Sate/Local	Federal
			(in dollars per additional dollar of revenue)			
	FACTOR TAXES					
1.	Labor		-0.036	0.026	-0.010	0.033
2.	Capital		0.447	0.520	0.383	0.445
3.	Property		0.378	n.a.	0.331	n.a.
	INCOME TAX					
4.	Individual income		1.270	0.178	0.152	0.189
		Lesser deduction for saving	0.087	0.110	0.090	0.110
		Smaller exclusion of capital income	0.588	0.610	0.607	0.620
	INDIRECT TAXES					
5.	Industry output		0.127	n.a.	0.128	n.a.
6.	Intermediate input		n.a.	0.049	n.a.	0.010
7.	Capital replacement		0.834	0.842	0.717	0.792
8.	Net saving		-0.168	-0.069	0.062	0.136
9.	Personal consumption		0.083	0.210	0.137	0.234
10.	Import duty		n.a.	-0.892	n.a.	0.213
	OTHER					
	Investment tax credit reduction (*a*)		0.128	0.314	0.254	0.406
11.	Non-resident withholding		n.a	-2.202	n.a.	-1.434
12.	ALL TAXES in lines 1-10.		0.200	0.183	0.201	0.195
	n.a.	Not applicable under base case assumptions.				
	(*a*)	Simulated as a sales tax on capital goods combining sales taxes on capital replacement and net saving.[3]				
Source: Author's calculations using GEMODEL.USA in its 14-sector version.						

[3] That an investment tax credit can be viewed as a negative sales tax on capital goods was suggested by Wayne R. Thirsk.

Table 1: Gains and Losses from Payroll-Tax Revenue Redistribution					
Experiment:	Welfare Cost		Cost to Losers per dollar gained by Gainers		Gain to the lowest income quintile
	National Cost	Efficiency Cost	National Cost	Efficiency Cost	
	($ billions)		(in $ per $		($ billions)
Demogrant	0.240	0.326	1.097	1.132	1.173
Relief	0.058	0.158	1.013	1.035	4.190
More Relief	0.463	1.267	1.011	1.030	41.810
Source: Author's calculations using GEMODEL.USA in its 14-sector version.					