NBER WORKING PAPER SERIES

UNCERTAINTY, WELFARE COST, AND THE 'ADAPTABILITY' OF U.S. CORPORATE TAXES

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Working Paper No. 1239

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
November 1983

This paper was written while Don Fullerton was a National Fellow at Hoover Institution, Standford University. We are grateful to the Sloan Foundation and the National Science Foundation for financial assistance. The research reported here is part of the NBER's research program in Taxation. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

Alternative corporate tax systems differ in their ability to adapt to changes in the rate of inflation. Absent complete indexing of depreciation allowances, a tax system may use the expected inflation rate to set accelerated depreciation allowances in a way that minimizes the welfare loss from the misallocation of capital. This welfare loss is a nonlinear function of the assumed inflation rate, however, so the welfare loss at the expected inflation rate may be quite different from the expected welfare loss. We compute these two welfare concepts for each of three alternative corporate tax schemes in the U.S. and for two different relationships between inflation and interest rates. One important finding is that the Auerbach-Jorgenson first year recovery plan is not equivalent to indexing as is often claimed, if uncertainty about inflation implies uncertainty about the real after-tax discount rate.

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1. Introduction

The design of a good tax system is often limited by compromises among several competing objectives. One's view of vertical equity may require a more progressive tax system for example, but this redistribution may increase excess burden and thus reduce economic efficiency. One's view of horizontal equity may require a more comprehensive tax base, but inclusions of imputed income or consumption items may make the tax system more complicated and reduce administrative efficiency. As a final example, policymakers might like to be able to change tax rules in reaction to business cycles or other new circumstances, but this flexibility conflicts with the goal of providing a certain tax environment for investors.

Efficiency and equity of various tax systems have been thoroughly studied in the literature of public finance. In this paper, we would like to compare alternative tax systems with respect to a slightly different goal, a goal we call "adaptability." Quite often, tax rules must be set for an indefinite period, before uncertainty about economic variables has been resolved. Yet we would like these fixed tax rules to adapt automatically to changes in these economic variables, without having to enact new rules. In particular, we would like the tax system to maintain its desired equity and efficiency properties in the face of inflation rates other than the single rate that might be expected.

Complete indexation would clearly help maintain the equity and efficiency of existing taxes across a variety of inflation outcomes, but this adaptability comes at the expense of considerable administrative difficulties. In practice, we are left with simpler schemes based on nominal income, fixed depreciation schedules, and historical cost accounting. Because assets vary in the extent to which actual allowances differ from economic depreciation at replacement cost, these schemes distort investment incentives, misallocate capital, and reduce overall welfare. For our purposes, however, it is important to note that inflation has different impacts on the incentive to invest in different assets. A given depreciation scheme may tax assets similarly at one rate of inflation and very dissimilarly at another. As a consequence, when policymakers choose among competing tax schemes on the basis of economic efficiency, they may have to use more than a single value for the expected rate of inflation. A more appropriate criterion may be the expected welfare cost rather than the welfare cost at the expected inflation rate.

In this paper, we compute these two welfare concepts for each of three alternative corporate tax schemes in the U.S. The first scheme is based on the set of allowances that existed in 1980; the second is based on the Accelerated Cost Recovery System (ACRS) as amended in 1982; and the third is based on the first year recovery plan of Auerbach and Jorgenson (1980). One important finding is that this first year recovery plan is not equivalent to indexing as is often claimed, if uncertainty about inflation implies uncertainty about the real after-tax return used for discounting.

For each scheme, we use a cost-of-capital formula similar to the one in Hall and Jorgenson (1967) to measure the incentive to invest in each of 33 assets. We then employ Cobb-Douglas demands for these assets in a partial equilibrium framework like that of Harberger (1966) to measure the welfare cost of differential incentives. This welfare cost for any one scheme depends nonlinearly on the rate of inflation used in the cost-of-capital formula. We plot this welfare cost, and we find that it is a convex function of the assumed inflation rate. As a consequence, the welfare cost for the expected inflation rate (a point on the curve) can be a substantial underestimate of the expected welfare cost (obtained by weighting together the welfare costs of the different possible inflation rates).

We look at a very particular kind of uncertainty in this paper. Policymakers face an uncertain environment when they must choose among alternative tax systems, but we assume that this uncertainty is resolved before investment takes place. This scenario is clearly counterfactual, but it allows us to study all of the relevant adaptability and efficiency issues discussed above while at the same time abstract from complex issues of how uncertainty affects investment incentives. In particular, it allows us to use the simple cost-of-capital formula for a firm facing certain rates of return and inflation.

Since this cost-of-capital formula and the Harberger excess burden formula have been exposited many times, the next section offers only the briefest possible summary of our methodology. We then outline one case where uncertainty about inflation causes uncertainty about the real after-tax rate of return, and another case where it does not. Section 3 makes these formulas operational with a brief description of the three alternative tax schemes, but again more complete expositions are available elsewhere. Section 4 provides discussion of our results, and Section 5 draws conclusions.

2. Methodological Framework

As in Hall and Jorgenson (1967), we consider a firm facing a certain nominal interest rate i and inflation rate π. The firm makes a one-dollar marginal investment in asset j that depreciates exponentially at rate δ_j and earns a marginal product c_j. Income from the asset is taxed at the statutory corporate rate u. The firm receives an immediate investment tax credit at rate k_j and delayed depreciation allowances on a fraction of the original purchase price given by the parameter a_j. The present value of these allowances per dollar of basis is z_j, where the firm discounts nominal future allowances by the nominal after-tax interest rate i(1-u). We thus assume arbitrage between debt and real capital as in Bradford and Fullerton (1981).

The profit-maximizing firm continues to make such investments until, in competitive equilibrium, the net cost of the asset $(1-k_j)$ is just equal to the present discounted value of after-tax returns and tax savings from the asset. This equilibrium condition is used to solve for the marginal product or rental cost c_j as a function of other parameters:

$$c_j = \frac{i(1-u) - \pi + \delta_j}{1-u}(1 - k_j - ua_jz_j) . \tag{1}$$

This cost is gross of depreciation and taxes, so the pre-tax return net of depreciation is $\rho_j = c_j - \delta_j$. This pre-tax return can easily vary among assets with different depreciation rates δ_j and/or allowances z_j. Depreciation indexing, however, could be set so that the firm receives economic allowances at replacement cost. The firm discounts by s, defined here as the certain real after-tax return $i(1-u) - \pi$. Thus, in this case, z_j equals $\delta_j/(s + \delta_j)$, and ρ_j reduces to $s/(1-u)$ for all assets. If the total corporate capital stock is fixed, the tax system does not distort its allocation in this case.

In general, taxes do distort the allocation of capital among assets. In this paper, we follow Hendershott and Hu (1980) and Gravelle (1982) in measuring the associated welfare cost by the Harberger formula:

$$W = \sum_{j=1}^{N} \left| \int_{\bar{K}_j}^{K_j^*} dc_j dK_j \right| \quad , \tag{2}$$

where $\bar{K}_j$ is the stock of asset j in the undistorted equilibrium, K_j^* is the stock in the distorted equilibrium, and N is the number of assets. To measure W, therefore, we need to know how the use of K_j depends upon its cost c_j. Econometric studies reviewed in Jorgenson (1974) suggest that firms' total use of capital changes by approximately one percent for each one percent change in its cost. This cost could conceivably be gross or net of depreciation, but gross costs are used in empirical work finding that gross output is a Cobb-Douglas function of capital and labor. No empirical work has measured price elasticities for each of the 33 capital assets used in this study, but we assume that the demand for each K_j has unitary elasticity with respect to its price c_j.

Expenditure on each type of capital is a constant under our assumptions, so dc_j in equation (2) can be expressed as a function of K_j. That is, $c_j K_j = c_j^* K_j^*$ for any K_j, so $dc_j = c_j^* K_j^*/K_j - c_j^*$. If $\bar{c}_j$ denotes costs in the undistorted equilibrium, then further algebra provides:

$$W = \sum_{j=1}^{N} \left| c_j^* K_j^* [\ln(\bar{c}_j/c_j^*) - 1 + c_j^*/\bar{c}_j] \right| \quad . \tag{3}$$

For the distorted equilibrium, capital costs c_j^* are given by equation (1) and capital use K_j^* is required data. We obtain the distorted capital allocation for 1980 from Jorgenson and Sullivan (1981), and we estimate the long-run distorted allocation for the other tax plans by using the same Cobb-Douglas reactions. Under ACRS, for example, K_j^* is given by capital expenditures under 1980 law divided by capital costs under ACRS.

For the undistorted (counterfactual) equilibrium, capital costs should be the same for all assets, but again these capital costs could be net or gross of depreciation. We wish to abstract from the considerable debate on this issue, but we follow Bradford (1980) in noting that welfare maximization requires the highest sustainable flow of net output, achieved where net marginal products are equated. Thus undistorted costs $\bar{c}_j$ are derived as $(\bar{\rho} + \delta_j)$, where $\bar{\rho}$ is a constant. Our particular choice for $\bar{\rho}$ is the capital-weighted average of ρ_j^* from the distorted equilibrium, such that both equilibria have the same aggregate pre-tax return, the same aggregate after-tax return, and the same total tax revenue.

Once we have data on tax parameters from the next section, equations (1) and (3) together provide capital costs and welfare costs as functions of i and π. These two parameters could be specified independently for a number of possible cases, but there is further reason to believe that the nominal interest rate is itself related to the inflation rate. Two plausible relationships are:

$$i = i_o + \pi/(1-u) \tag{4a}$$

and

$$i = i_o + \pi \quad , \tag{4b}$$

where i_o is the interest rate in the absence of inflation. In the first relationship, called Modified Fisher's Law (MFL) by Bradford and Fullerton (1981), inflation adds more than point-for-point to the nominal interest rate. This relationship insures that s, the real after-tax rate of return, is invariant with respect to inflation. Fraumeni and Jorgenson (1980) provide some evidence in support of this proposition, but it need not be viewed as an empirical relationship. Instead, we may wish to make the ceteris paribus assumption that s is fixed as we look at different π. Equation (4b) has been called Strict Fisher's Law (SFL), as inflation adds exactly point-for-point to nominal interest. Summers (1981) and others suggest that this is an empirical upper bound on the impact of inflation.

In one set of calculations below, we set i_o at .04, use equation (4a), vary inflation, and calculate W as a function of π. Policymakers face uncertainty about π, but equation (4a) insures that s is always 4 percent. In a second set of calculations, we set i_o such that the real after-tax rate of return is .04 when inflation is 7 percent. We then vary π in equation (4b) such that the real after-tax return varies with inflation. In this case, because s depends on π, uncertainty about inflation creates further uncertainty about the after-tax rate of return. In either case, W can be written as $W(\pi)$. We assume that policymakers face a distribution of possible inflation rates centered around a mean of 7 percent. For computational simplicity, we use an approximate uniform distribution, where each inflation rate between 1 percent and 13 percent is equally likely, but other distributions would yield similar results. Where E is the expectations operator, we show how $E[W(\pi)]$ differs from $W[E(\pi)]$.

3. The Specification of Alternative Tax Regimes

We start with a description of credits and allowances that existed in 1980, before President Reagan's recent tax reform initiatives. We then describe the Accelerated Cost Recovery System (ACRS) as introduced in the Economic Recovery Tax Act of 1981 (ERTA) and amended in the Tax

Equity and Fiscal Responsibility Act of 1982 (TEFRA). Finally, we describe an alternative scheme suggested by Auerbach and Jorgenson (1980). More description of these tax plans and their modelling can be found in Fullerton and Henderson (1983). For all of these reforms, we assume that the firm can use all credits and allowances on depreciable assets, and LIFO accounting for inventories, in order to minimize taxes. The real return to land and inventories, as well as other taxable income, is subject to the statutory rate u given by the top corporate rate bracket of 46 percent.

For each plan, we evaluate incentives to invest in each of the 33 asset types listed in Table 1. The first 20 assets are types of equipment, the next 11 are types of structures, and the last two are inventories and land. We treat each of these assets as individually homogenous, in the sense that each has a single tax treatment and economic depreciation rate (δ_j). Hulten and Wykoff (1981) provide estimates of δ_j, shown in column 1 of Table 1.

As of 1980, the investment tax credit stood at a ten percent rate for all public utility structures (assets 24-28) and for equipment with tax lifetimes of at least seven years. The credit was 6.7 percent for equipment with a lifetime of at least five years (assets 4 and 14) and 3.3 percent for equipment with a lifetime of at least three years (asset 15). These rates are shown in column 2 of Table 1.

The Asset Depreciation Range (ADR) System, in effect in 1980, allowed firms to depreciate equipment and public utility structures over lifetimes given by 80 to 120 percent of the many diverse "Guideline" lifetimes that were set in 1962. Jorgenson and Sullivan (1981) estimated guideline lifetimes for each of our more aggregate asset categories, but we assume that firms minimize taxes. We therefore use 80 percent of these guideline lifetimes for eligible assets, unless that choice would raise taxes by lowering the investment tax credit. Computers, for example, could be depreciated over 5 years with a 6.7 percent credit, but taxes are lower if the firm uses 7 years in order to receive the 10 percent credit. Tax minimizing lifetimes for all assets are shown in column 3 of Table 1.

Also, in 1980, equipment and public utility property were eligible for double declining balance (DDB) or sum-of-the-years'-digits (SYD) methods of depreciation. If we define L as the asset's lifetime for tax purposes, then DDB allows depreciation equal to 2/L of the remaining basis each year. Because of the half-year convention, however, all assets are assumed to have been purchased on July 1. They receive half of the DDB amount (that is, 1/L) in the year of purchase, leaving a basis of (1-1/L). They then receive 2/L of this remaining basis in the first full year of ownership. At this point, as shown in Fullerton and Henderson (1983), the firm would minimize taxes by switching to SYD. If there are 3.5 years left (as for a 5 year asset), the firm takes the basis remaining at the time of the switch and divides it over the remaining years according to the fractions obtained by using a denominator of 8.0 and numerators of 3.5, 2.5, 1.5, and 0.5.

For other structures firms could use 150 percent of declining balance (1.5/L of remaining basis each year), with an optimal switch to straight-line after one-third of the life of the asset. These depreciation allowances, specified by law over a finite number of years for each asset, are discounted by the firm's nominal after-tax rate of return because allowances are based on historical cost. Since the entire purchase price was depreciable in 1980, we use 1.0 for the parameter a_j.

We have now specified enough information to calculate the equilibrium pre-tax return, or net marginal product, under 1980 law for each asset. These are shown in column 4 of Table 1 for the case of a 7 percent rate of inflation and fixed 4 percent real after-tax rate of return. Because of credits and accelerated depreciation allowances in 1980, the required pre-tax return on investment in equipment is considerably less than that of other assets. Land and inventories receive "economic" depreciation allowances at rate zero, since they do not depreciate, but inflation reduces the real value of allowances on some structures to less than economic depreciation at replacement cost. Associated welfare losses could be reduced by moving resources from low to high marginal product investments, until the net marginal products were equated. The next section discusses estimates of welfare cost.

The Accelerated Cost Recovery System (ACRS) was introduced in 1981 and amended in 1982. It establishes an investment tax credit of six percent for autos (asset 15) and ten percent for all other equipment and public utility property. These credit rates are shown in column 5 of Table 1. For lifetimes, the law assigns three years to autos, five years to other equipment, ten years to some public utility structures, and fifteen years to other structures. These lifetimes are shown in column 6. The 1981 law specified a transition to more accelerated depreciation schedules, but the 1982 law repealed the transition and left equipment and public utility structures at 150 percent of declining balance with an optimal switch to straight line after one-third of the life of the asset. It also reduced depreciable bases by one-half the investment tax credit, so a_j is .97 for autos and .95 for other equipment and public utility property. Other structures receive 175 percent of declining balance with an optimal switch to straight line after three-sevenths of the life of the asset (see Fullerton and Henderson, 1983).

Pre-tax returns for this 1982 version of ACRS are shown in column 7 of Table 1, for the case of 7 percent inflation and fixed 4 percent real after-tax return. Most types of equipment experience reductions from 1980 law, and most pay very small taxes in the sense that the pre-tax returns barely exceed the 4 percent after-tax return to the corporation. Taxes on structures are also reduced, but nondepreciable assets are unaffected. King and Fullerton (1984, Chapter 6) find that the new corporate tax system provides a net subsidy to investment, when they add consideration of debt finance, interest deductions, and additional personal taxes. In their model, the total tax wedge rises when the corporate tax and all allowances are eliminated.

The Auerbach-Jorgenson (AJ) first year recovery plan would provide the firm with one depreciation deduction at the time the asset is purchased. It would eliminate the investment tax credit and calculate the one-time deduction as the present value of economic depreciation. Policymakers could use the Hulten-Wykoff estimates of exponential depreciation rates (δ_j) and discount at the real after-tax interest rate (s) to obtain the deduction (z_j) as $\delta_j/(s + \delta_j)$. Substitution into equation (1) implies that ρ_j equals s/(1-u) for all j, so the tax scheme appears not to distort the allocation of capital among assets. Pre-tax returns on all assets are .0741, for comparison with the varying pre-tax returns found in column 4 or column 7 of Table 1. This neutrality, however, depends on the accuracy of economic depreciation rates and the firm's real after-tax discount rate that are used by policymakers to set the first year deduction. If the firm uses different depreciation rates or a different discount rate, then the required pre-tax rate of return that it faces may not be the same for all assets.

We have no way here to judge the quality of depreciation rate estimates, but we are concerned with the discount rate used to set the first year allowance. Under Modified Fisher's Law, as described above, uncertainty about inflation does not create uncertainty about the after-tax return. If policymakers can accurately estimate this fixed after-tax return used for discounting, then they can set the first year allowance for each asset such that pre-tax returns are all equal. Under Strict Fisher's Law, however, after-tax returns fall with inflation. Policymakers might use the expected s to discount economic depreciation and set the first year allowances, but firms generally evaluate their investment incentives after policy has been set and after they have more information about s. If they use a discount rate other than the one used by government, then the present value of depreciation may not equal the first year allowance, and pre-tax returns may vary. To avoid interasset distortions in this case, economic depreciation must be allowed as it occurs, completely indexed for inflation.

4. Welfare Results

For each tax scheme, a given rate of inflation can be used in equation (4a) or (4b) to get the nominal interest rate, in equation (1) to get pre-tax returns, and in equation (3) to estimate welfare costs from differential taxation of assets. Rather than report absolute dollar amounts, however, we find it useful to express welfare costs as a fraction of estimated tax revenue. This ratio is not limited to prices of a particular year, and it provides a useful measure of the efficiency of each tax. For revenue in the denominator, we use the aggregate difference between pre-tax returns and after-tax returns, as measured by $\sum_j K_j(\rho_j - s)$. This denominator is not the actual revenue in any particular year, but it indicates the long-run annual amount that could be collected by the relevant tax scheme if all investments were financed by equity and earned the hypothesized returns.

When ACRS lumped many diverse kinds of equipment into a single five-year category, and many kinds of structures into a single fifteen-year category, it effectively abandoned any attempt to provide allowances based on economic depreciation. It introduced new variance among required pre-tax returns, but it achieved its primary objective of providing investment incentives by reducing those pre-tax returns. As a result, welfare cost ratios tend to be higher under ACRS than under the 1980 law, both because absolute welfare costs are higher and because long run revenues are lower.

In designing the 1980 law or ACRS, policymakers may have expected a particular rate of inflation, and they may have set accelerated depreciation allowances at least partly to offset the tax-raising effects of historical cost depreciation. If either tax law is fixed while inflation turns out to be very low, however, then equipment is highly subsidized and structures are less highly taxed. Long run revenues from depreciable assets can be arbitrarily small, and welfare cost ratios can be arbitrarily high. Increased inflation then raises the tax on equipment more than on structures, makes pre-tax returns more similar, raises long-run revenue, and reduces the welfare cost ratio. This falling welfare cost ratio is plotted against the inflation rate for each tax law in Figure 1, assuming Modified Fisher's Law of equation (4a). Real after-tax rates of return are fixed in this case, so welfare costs under the Auerbach-Jorgenson plan are measured at zero.

The cost-of-capital and excess burden framework in this paper is not new. Many studies have used a similar framework to measure the welfare costs from differential taxation of assets. Most of these studies use a single expected rate of inflation, however, and report a single welfare cost estimate. Figure 1 indicates two major problems with this approach. First, the rapidly falling curves indicate that welfare cost is very sensitive to the choice for a single rate of inflation. Second, even with a good estimate of the expected inflation rate, $E(\pi)$, the welfare cost $W[E(\pi)]$ may be a poor substitute for the expected welfare cost $E[W(\pi)]$. We use as an example the case where inflation rates between 1 percent and 13 percent are equally likely, while the real after-tax interest rate is 4 percent. If only the expected 7 percent inflation rate is used in equations (4a), (1), and (3), we find that welfare cost under the 1980 law is 2.8 percent of long run revenues. This point can be taken from the curve in Figure 1, at 7 percent inflation. All points on the curve are equally likely, however, and the mean of the different possible welfare cost outcomes under 1980 law is almost 4 percent of revenue. Under ACRS, $W[E(\pi)]$ is 3.5 percent of revenue, while $E[W(\pi)]$ is 4.8 percent of revenue. In general, because the curve is convex to the horizontal axis, $E[W(\pi)]$ is greater than $W[E(\pi)]$ for any distribution of inflation rates.

The same two problems are apparent in Figure 2 for the case of Strict Fisher's Law in equation (4b). Uncertainty about inflation in this case implies further uncertainty about the real after-tax rate of return. Again welfare cost ratios are very sensitive to the inflation rate, and again the curves are convex. The welfare cost ratio at 7 percent inflation underestimates the correct expected welfare cost ratio by 22 percent under 1980 law and by 13 percent under ACRS.

Inflation reduces the real value of depreciation allowances, but it does not affect the relatively high tax on nondepreciable assets such as land and inventories. Thus, up to a point in Figure 2, inflation reduces welfare costs by raising taxes on equipment and structures. Once the cost of depreciable capital exceeds the cost of nondepreciable capital, however, further inflation makes them less equal and raises welfare costs. This turning point is reached at 11 percent inflation under 1980 law and at 12 percent inflation under ACRS. (The same phenomenon occurs with Modified Fisher's Law, but the rate of inflation would have to exceed 13 percent before it erodes the real value of depreciation allowances enough to make the cost of equipment and structures as high on average as the cost of land and inventories.)

As can be seen in Figure 2, the Auerbach-Jorgenson plan is no longer neutral in the case where the inflation outcome may affect the real after-tax return, that is, where s may be written $s(\pi)$. Policymakers must use a single rate such as the expected after-tax return E(s) to discount economic depreciation and set the first year allowance. The AJ deduction must be set long before investment takes place, however, so firms may be able to obtain much more information about s. In the extreme case of this paper, where all uncertainty is resolved before the firm invests, the required pre-tax return may be written as

$$\rho_j(\pi) = \frac{s(\pi) + \delta_j}{1 - u}\left[1 - \frac{u\delta_j}{E(s) + \delta_j}\right] - \delta_j \qquad (5)$$

If s turns out to equal E(s), then ρ_j reduces to s/(1-u) for all assets, and the tax is nondistorting. Given our approximate uniform distribution, as an example, policymakers would use the expected 7 percent inflation rate and the expected 4 percent discount rate to set the first year allowances. If expectations are realized, Figure 2 shows that welfare costs are zero. If inflation is anything other than 7 percent, then s does not equal E(s), and equation (5) shows that ρ_j depends on δ_j. Different assets have different pre-tax returns, and the tax is no longer neutral. Welfare costs rise above zero for inflation rates less than 7 percent or more than 7 percent, so Figure 2 also shows a convex function for welfare cost ratios under AJ. Welfare costs at the expected rate of inflation are zero, but the mean of the equally likely welfare cost outcomes is .5 percent of revenues.

A final interesting aspect of Figure 2 is that the three curves cross. While ACRS has the highest welfare cost ratio for most inflation outcomes, it is not necessarily the most distorting of the three tax proposals. If the inflation rate is 10, 11, or 12 percent, under our assumed parameters, then welfare costs from the 1980 law are larger as a proportion of revenues. If inflation turns out to be 13 percent, under deductions set for the expected 7 percent rate, then the Auerbach-Jorgenson plan is most distorting. If we do not know the inflation rate before we choose a tax plan, then we cannot know that our choice will minimize excess burden. We could choose the plan with the lowest expected welfare cost, but any plan might turn out to have the highest welfare cost.

5. Conclusion

Tax policy is limited by the fact that laws must be set in an uncertain environment. Fixed depreciation schedules designed for a period of high inflation may not perform well during periods of low inflation, and vice versa. Recognizing that legislative changes can be slow, a good tax law would be "adaptable" enough to operate efficiently over a range of economic outcomes.

We compare the efficiency of three possible tax schemes for the U.S. under a variety of parameter outcomes. When uncertainty about inflation creates uncertainty only about the nominal interest rate, we find that investment distortions cause greater welfare losses under ACRS than under 1980 law for all levels of inflation. As welfare losses decline with inflation, the difference between the two laws becomes small. In addition, because welfare costs are a convex function of the inflation rate, the expected welfare cost can be significantly greater than the welfare cost measured at the expected inflation rate.

As long as policymakers can correctly identify the firm's real after-tax discount rate in order to calculate the present value of economic depreciation, the Auerbach-Jorgenson first year recovery plan does not distort the choice among assets. When uncertainty extends to the after-tax rate of return, however, AJ may no longer be neutral. First year deductions may be set using the expected after-tax return, but the cost-of-capital varies among assets if firms use a different after-tax return to discount economic depreciation. Auerbach and Jorgenson (1980) are correct that "these allowances would be unaffected by inflation or by variations in its rate," (p. 117), but the point is that neutrality would <u>require</u> the allowance to react when inflation variability affects the after-tax return.

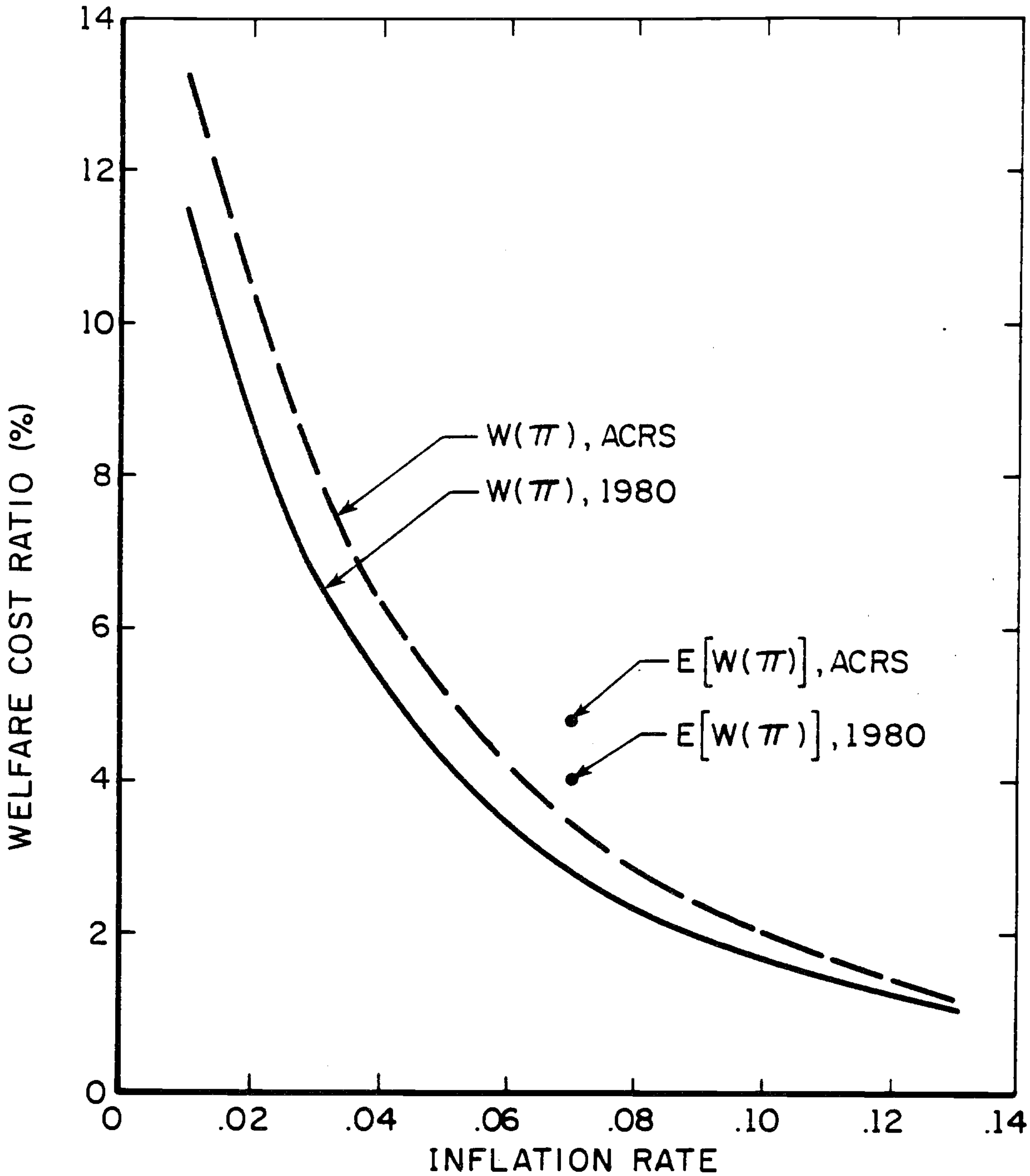
Our results indicate that policymakers cannot know with certainty which tax plan will cause the smallest welfare cost. The Auerbach-Jorgenson plan performs best for a wide range of inflation outcomes, but its welfare cost ratio rises rapidly at high inflation where government has over-estimated the real after-tax return. If ex post indexing is not an option, then policymakers may wish to set first-year deductions by systematically underestimating the real after-tax discount rate. Such a policy would minimize the chance that large losses would occur under AJ. At the extreme, with the use of a zero discount rate, this policy would imply fully expensing of new investments and an associated loss of tax revenue. Absent ex post indexing, full expensing is the only policy certain to avoid distorting the choice among assets.

Table 1

Tax Parameters and Pre-tax Return for Each Asset

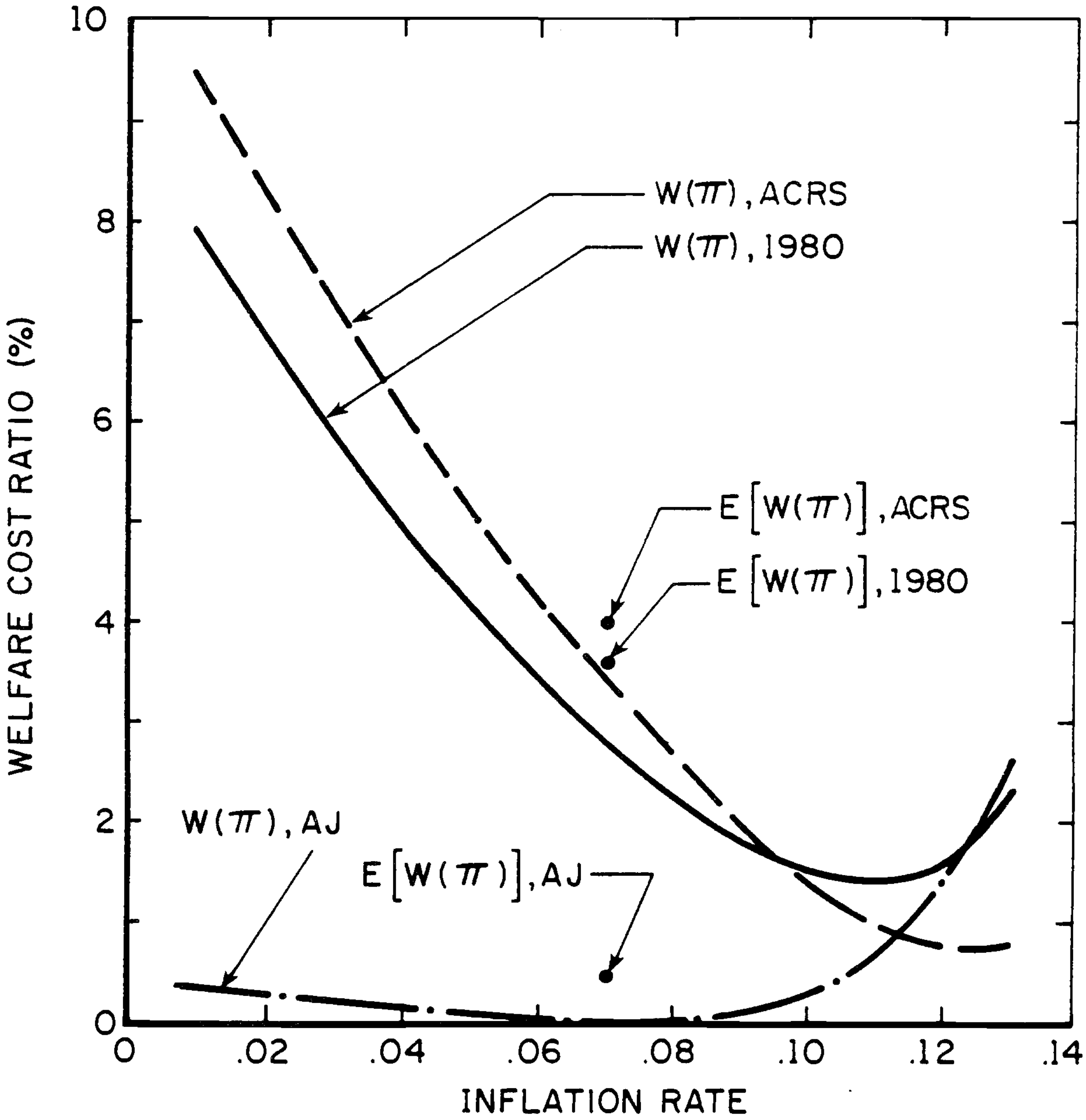
		1.	1980 Law			ACRS		
		Hulten-Wykoff	2.	3.	4.	5.	6.	7.
		Depreciation Rate	ITC Rate	Lifetime	Pre-Tax Return*	ITC Rate	Lifetime	Pre-Tax Return*
1	Furniture and Fixtures	.110	.100	8.00	.0437	.100	5.00	.0433
2	Fabricated Metal Products	.092	.100	10.00	.0483	.100	5.00	.0429
3	Engines and Turbines	.079	.100	12.48	.0526	.100	5.00	.0426
4	Tractors	.163	.067	5.00	.0438	.100	5.00	.0444
5	Agricultural Machinery	.097	.100	8.00	.0433	.100	5.00	.0430
6	Construction Machinery	.172	.100	7.92	.0448	.100	5.00	.0446
7	Mining and Oil Field Machinery	.165	.100	7.68	.0436	.100	5.00	.0445
8	Metalworking Machinery	.123	.100	10.16	.0508	.100	5.00	.0436
9	Special Industry Machinery	.103	.100	10.16	.0495	.100	5.00	.0431
10	General Industrial Equipment	.123	.100	9.84	.0498	.100	5.00	.0436
11	Office and Computing Machinery	.273	.100	7.00	.0410	.100	5.00	.0468
12	Service Industry Machinery	.165	.100	8.24	.0460	.100	5.00	.0445
13	Electrical Machinery	.118	.100	9.92	.0498	.100	5.00	.0435
14	Trucks, Buses, and Trailors	.254	.067	5.00	.0455	.100	5.00	.0464
15	Autos	.333	.033	3.00	.0499	.060	3.00	.0449
16	Aircraft	.183	.100	7.00	.0407	.100	5.00	.0449
17	Ships and Boats	.075	.100	14.40	.0557	.100	5.00	.0425
18	Railroad Equipment	.066	.100	12.00	.0504	.100	5.00	.0423
19	Instruments	.150	.100	8.48	.0465	.100	5.00	.0442
20	Other Equipment	.150	.100	8.16	.0452	.100	5.00	.0442
21	Industrial Buildings	.036	.0	28.80	.0824	.0	15.00	.0689
22	Commercial Buildings	.025	.0	47.60	.0824	.0	15.00	.0645
23	Other Nonfarm Buildings	.045	.0	30.90	.0889	.0	15.00	.0724
24	Railroads	.018	.100	24.00	.0545	.100	15.00	.0536
25	Telephone and Telegraph	.033	.100	21.60	.0567	.100	15.00	.0573
26	Electric Light and Power	.030	.100	21.60	.0559	.100	15.00	.0565
27	Gas Facilities	.030	.100	19.20	.0540	.100	10.00	.0500
28	Other Public Utilities	.045	.100	17.60	.0553	.100	10.00	.0522
29	Farm Structures	.024	.0	25.00	.0735	.0	15.00	.0642
30	Mining, Shafts and Wells	.056	.0	6.80	.0619	.0	5.00	.0555
31	Other Nonbuilding Facilities	.029	.0	28.20	.0782	.0	15.00	.0662
32	Inventories	.0	.0	∞	.0741	.0	∞	.0741
33	Business Land	.0	.0	∞	.0741	.0	∞	.0741

* The pre-tax return is based on a 4 percent real after-tax return and a 7 percent inflation rate.



WELFARE COST UNDER MFL

FIGURE 1



WELFARE COSTS UNDER SFL
FIGURE 2

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