NBER WORKING PAPER SERIES

DOES THE TAX SYSTEM FAVOR INVESTMENT IN HIGH-TECH OR SMOKE-STACK INDUSTRIES?

Don Fullerton

Andrew B. Lyon

Working Paper No. 1600

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 1985

The research reported here is part of the NBER's research program in Taxation and project in Government Budget. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #1600
April 1985

Does the Tax System Favor Investment in High-Tech or Smoke-Stack Industries?

ABSTRACT

When tax rates vary by asset, a "hidden" industrial policy may aid industries that invest in a certain mix of assets. In this paper, we examine whether differential use of depreciable assets gives rise to differential tax treatment of high technology industries relative to other industries. First, we calculate the total effective tax rate on a marginal investment in each of 34 assets. Next, using these asset-specific tax rates and weighting by the use of these assets in each of 73 different industries, we calculate total effective tax rates at the industry level. We find considerable variation within the high-tech sector and within the more traditional sector, but for the case of a taxable firm with a given debt/equity ratio, we do not find any systematic differences between overall rates in the two sectors.

Don Fullerton
Department of Economics
University of Virginia
Charlottesville, VA 22901
(804) 924-7581

Andrew B. Lyon
Department of Economics
Princeton University
Princeton, NJ 08544

The apparent decline of U.S. productivity growth, and its consequences for the ability of the U.S. to maintain its international competitiveness, have stirred considerable debate on the need for a U.S. industrial policy. Against this setting, observers of the U.S. tax system have noted that the widely varying tax treatments of capital investments may already provide a _de facto_ industrial policy, one that encourages investment in certain sectors of the economy while discouraging investment elsewhere. "High-technology" firms claim that tax provisions discourage investment in their industries relative to general manufacturing; at the same time, financially troubled "smoke-stack" firms claim that they too are disadvantaged by the tax law. Understanding how tax provisions apply to different industries is an important objective in promoting international competitiveness, neutrality in the tax code, and efficiency in the production of goods and services.

Major changes in the tax system occurred in 1981 with the Economic Recovery Tax Act and in 1982 with the Tax Equity and Fiscal Responsibility Act. These bills greatly accelerated depreciation deductions on many assets, and they resulted in effective tax rates that vary widely among assets. Since firms in different industries use different mixes of assets, they pay different taxes and face different investment incentives. The purpose of this paper is to compare the tax burden on a marginal investment in high-tech industries with that of other industries, to see where differences arise and which provisions of the tax code are responsible for these differences.

We first consider a profitable firm with the average sources of finance, and we measure effective tax rates on marginal investments in each of 34 different depreciable assets. These rates account for personal and property taxes as well as for differential investment tax credits and depreciation allowances under the corporate tax. We then employ Commerce Department data on the mix of investments made by each of 73 different industries (listed in Table 3 below). We thus obtain effective tax rates with more disaggregation by industry than is available in the literature, enough to isolate seven individual industries that can be classified as "high-tech".

We find much variation in the tax rates facing the seven high-tech industries, but as a group, they are taxed no differently than the other 66 industries. Moreover, recent changes in tax law made no impact on the relative taxation of the two groups. Finally, we test the sensitivity of these effective tax rates to changes in assumptions about the expected rate of inflation, the expected rate of return, the firm's profitability for the use of tax subsidies, the economic lifetimes for assets, and the debt/equity ratio for financing. We find that changes in these parameters do not affect our basic conclusion: to the extent that there are differences in the overall tax burdens of high-technology and other industries, they are not attributable to differences in the tax treatment of depreciable assets.

The next section defines the concept of effective tax rate that we measure, while following sections describe results and make concluding remarks.

Marginal Effective Total Tax Rates

The average effective tax rate includes the taxes actually paid as a fraction of capital income. Such rates were used by Harberger (1966) in his seminal study of the efficiency cost of differential effective tax rates. They have been measured more recently by Feldstein and Summers (1979), Feldstein, Dicks-Mireaux, and Poterba (1983), and Hulten and Robertson (1984). Actual tax payments may include some lump-sum elements, however, and may not reflect the expected future taxes on the expected income from a marginal dollar of investment.[1] This study uses the concept of a marginal effective tax rate, as defined and measured in such studies as Auerbach and Jorgenson (1980), Hulten and Wykoff (1981a), Gravelle (1982), and Hulten and Robertson (1982, 1984). Those studies look at corporate taxes only, whereas Fullerton and Henderson (1984) and King and Fullerton (1984) look at the total of corporate, personal and property taxes.

The tax rates on different assets are thoroughly exposited in those sources, and a more complete description of the method we follow may be found in Fullerton and Henderson (1984), hereafter FH. A profitable firm faces statutory corporate tax rate u, deductible property tax per dollar of asset at rate w, exponential depreciation rate δ, inflation rate π, nominal after-tax discount rate r, investment tax credit rate k, and present value of depreciation allowances per dollar of investment z. In competitive equilibrium, the firm equates the net cost of the asset to the present value of net returns. Following Hall and Jorgenson (1967), FH then show that the social return ρ, gross of taxes but net of depreciation, can be written as:

$$\rho = (1 - k - uz)(r - \pi + \delta)/(1 - u) + w - \delta \,. \tag{1}$$

Assuming arbitrage between bonds and real capital, all assets must earn the discount rate given by i(1-u) where i is the nominal interest rate. For the fraction f_d of the marginal investment that is financed by debt, the saver with marginal rate m_d earns $i(1-m_d)$; for the fraction f_{re} financed by retained earnings, the after-corporate-tax return i(1-u) is subject to a low effective capital gains tax m_{re}; and for f_{ns} financed by new share issues, the return is eventually subject to dividend taxes at rate m_{ns}. The weighted-average return is:[2]

$$s = f_d i(1-m_d) + f_{re} i(1-u)(1-m_{re}) + f_{ns} i(1-u)(1-m_{ns}) - \pi \ . \qquad (2)$$

The marginal effective total tax rate is the proportional difference between the pretax return and the posttax return:

$$t = (\rho - s)/\rho \ . \qquad (3)$$

In the actual calculations, we generally set s and then solve for the implied interest rate from (2). With i, we get the social rate of return on each asset from (1) and the tax rate from (3). For our standard case, we set $s = .05$ and $\pi = .07$, but we test the sensitivity of these and other parameters. As in FH, $u = .495$ to reflect both federal and state corporate taxes. Property tax rates are .00768 for equipment, .01126 for structures, and .01550 for public utilities. Personal tax rates are .238 for interest, .356 for dividends, and .058 for capital gains. These reflect ownership through tax-exempt vehicles and insurance companies, and the deferral of capital gains. Weights f are given by .0490, .6143, and .3367 for new shares, retained earnings, and debt finance, respectively. Depreciation rates for the 34 assets derive from Hulten and Wykoff (1981b), while credits and allowances are set for each asset from the law.

The FH paper shows the value of k and the tax lifetime for each asset, and it thoroughly describes our derivation procedures for z, the present value of allowances for each asset. In brief, most equipment under the old tax law (through 1980) was depreciated by double declining balance with lifetimes based on the Asset Depreciation Range System. Seven-year assets received a 10 percent investment tax credit, reduced by one-third for five-year assets and by two-thirds for three-year assets. The Economic Recovery Tax Act of 1981 (ERTA), if it had been allowed to become fully effective as scheduled by 1986, would have retained double declining balance for equipment while reducing lifetimes to 3 years for autos, 5 years for other equipment, 10 years for some public utility structures, and 15 years for other structures. The credit was 6 percent for autos and 10 percent for other equipment. Partly because effective tax rates would have been reduced drastically, as shown below, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) cut off the transition back to double declining balance and left equipment with 150 percent of declining balance. It also reduced the depreciation basis by half the investment tax credit.

Results

The first column of Table 1 shows how the marginal effective tax rate under the old law varied from a low of -4 percent for aircraft with credits and relatively short lifetimes, to 51 percent for certain structures with no credits and relatively long lifetimes. An effective subsidy means that the value of the credits, depreciation allowances, and interest deductions at the corporate level more than offset not only the corporate tax on the income from this asset, but any property tax and personal tax as well. The subsidy to the asset is received in the form of reductions in other corporate taxes. The second column shows that ERTA, if fully phased in, would have made all equipment tax rates negative while reducing structure tax rates somewhat. Either because of the greater disparity of tax rates across assets, or because of the greater pending revenue shortfall, Congress raised effective tax rates on equipment by passing TEFRA. Column 3 shows that only some types of equipment now face effective subsidies.

In order to test the sensitivity of these results for current law (TEFRA), we select two kinds of equipment in Table 2. The effective tax rates on both assets rise somewhat with inflation because of historical cost depreciation, despite the fact that higher nominal interest is deducted at a .495 corporate rate and included at a .238 personal rate. Effective tax rates rise slightly with the assumed net rate of return, but they fall dramatically with higher investment tax credits. Both assets receive 10 percent credits and the same depreciation schedules, even though actual depreciation rates differ (.079 for engines and turbines and .273 for office and computing machinery). As a consequence, any row of Table 2 shows the sensitivity of results to this difference in economic depreciation.

From asset-specific effective tax rates similar to ours, Gravelle (1982) obtains tax rates for 11 broad industries and 23 manufacturing sub-industries by using data on the stock of each asset employed in each industry. While capital stock weights might be preferred on conceptual grounds, available data is insufficiently detailed to separate high-tech industries. Here, we use weights given by gross investment in each of these 34 assets by each of the 73 industries listed in Table 3. The weights from the old law are used for all three laws, even though tax changes might induce some substitution among assets.[3] Another potential problem is that these investments include only equipment and structures, while we may wish to consider the taxation of investment in land, inventories, and intangible assets.

Several definitions of "high-tech" industry have been suggested.[4] We use a strict definition that classifies an industry as high-tech if its ratio of R&D expenditures to net sales is twice the national average. Of the 73 industries, this standard is most closely met by seven, including the production of 1) drugs, 2) office and computing equipment, 3) radio, T.V., and communication equipment, 4) electronic components, 5) aircraft and parts, 6) scientific instruments, and 7) optical equipment. The seven high-tech industries are marked by double asterisks in Table 3.

Any such definition is beset by a number of problems. First, many firms cannot be so easily allocated to a single industry. General Motors manufactures its own microchips, even though it may be the quintessential example of a smoke-stack firm. Second, while the seven high-tech industries have the highest ratios of R&D to net sales, they account for only a small fraction of total R&D. Ford, GM, and Dupont together undertake more R&D than the entire computer, software, and office equipment industries combined.[5] Third, high-tech definitions may be based on processes rather than on products. In fact, many traditional manufacturers have installed computerized assembly lines using robots to help produce conventional goods, even though they themselves may undertake little R&D. Nevertheless, our seven industries embody many of the characteristics that one normally associates with high-technology activities.

In the report underlying this research, Fullerton and Lyon (1983) provide more detail on the composition of these industries and their investments. In particular, equipment composes about 90 percent of depreciable investment in construction but only 50 percent of the depreciable investment in petroleum refining. High-tech industries are generally equipment-intensive, varying between 87 percent for aircraft and 72 percent for drugs. These ratios are reflected in Table 3, where for the 1980 law, effective tax rates range from 10 percent for construction to 34 percent for petroleum refining.[6] Among high-tech industries, the lowest rate is 17 percent for aircraft and the highest is 24 percent for drugs and scientific instruments. The average rate for high-tech industries is 22 percent, only one point lower than the average for all industries.

With the rapid depreciation allowances scheduled under ERTA to begin in 1986, investments would have faced net subsidies in most industries, including all high-tech industries. The effective tax rate is -11 percent for high-tech industries and -7 percent overall. The third column shows rates under TEFRA, where allowances for equipment are scaled back, and all industries are left with positive effective tax rates. High-tech and other industries still differ only by one percentage point, at 13 and 14 percent respectively, as shown at the bottom of the column. In fact, the 73 industries in Table 3 are ordered according to their effective tax rates under TEFRA in the third column. The general dispersion of double asterisks indicates that the taxation of high-tech industries varies as much as the taxation of other industries.[7]

Until now we have assumed that our typical firm has sufficient profits to utilize all depreciation allowances and investment tax credits associated with the marginal investment. This assumption is not valid for many start-up firms in high-tech industries or for ailing firms in smoke-stack industries. Many authors, notably Auerbach (1983), have investigated the effect of tax law asymmetries on the incentives to invest. However, it is difficult to make any generalizations about how much investment takes place in start-up firms that are still unprofitable, or in smoke-stack firms that have become unprofitable, and how long each type of firm expects to remain in that state.

The effective tax rate for a firm that does not expect to earn taxable profits over the entire life of a new investment can be found by setting u and k to zero. In this case, only property taxes differ by asset, resulting in effective rates that lie between 34 and 38 percent for all industries. The overall average is 35 percent in both sectors. This calculation also indicates that repeal of the corporate tax would raise effective tax rates: credits, allowances and deductions more than offset corporate taxes under any version of the law.[8]

High-tech firms also claim that their assets become obsolete faster than those in other industries. To account for the possibility that the Hulten-Wykoff depreciation rates do not adequately capture obsolescence of some high-tech assets, we increase by twenty percent the economic depreciation rates on ten selected assets (numbers 3, 8, 9, 10, 11, 12, 13, 19, and 20 in Table 1). These assets are used to different degrees by different industries. Effective tax rates increase by less than 2 percent for most of these assets, by .8 percent for the economy, and by 1.1 percent for high-tech industries.

It is also suggested that start-up firms in high-tech industries, with little tangible capital, may rely primarily on equity finance. Interest payments are deductible at the corporate level while the return to equity is not, so the tax system may place a greater burden on firms with a high proportion of equity. However, start-up firms are likely to retain a greater proportion of earnings than mature firms, and they may thus receive more favorable capital gains treatment of earnings at the personal level. Note also that if the valuable ideas of the start-up firm are windfall events not affected by marginal incentives, then the extra tax on equity finance may be more important for the issue of tax incidence than of allocational efficiency.[9]

To account for the possibility that some firms are constrained by the amount of debt they can issue, we cut by half the proportion for debt and increase equity accordingly. Marginal effective tax rates are very sensitive to this change. Under TEFRA, effective tax rates increase from 13 and 14 percent to 37 and 38 percent, for high-tech and other industries respectively. There is little change, however, in the ranking of industries.

We are unable to determine the differential effect of including the tax burden on investments in land, inventories, and intangible assets such as R&D. Hulten and Robertson (1984) examine actual tax payments and compute average effective tax rates for industries at the two-digit SIC level. They find that average tax rates are higher for the high-tech sector than for the smoke-stack sector. Given the many theoretical differences between average and marginal effective tax rates, however, it is not clear whether the higher average tax rate for high-tech industries results from greater investment in non-depreciable assets omitted from our study, or whether it is caused by the non-distortionary taxation of windfall gains and inframarginal profit. The latter do not affect marginal investment incentives. To the extent that any tax differences may arise between high-tech and other industries, we may only conclude that these differences are not caused by the tax treatment of depreciable assets.

Conclusion

Differential effective tax rates can create significant economic costs by distorting the choice of assets by firms within an industry, and by distorting the allocation of capital among industries. For a profitable firm with a given debt-equity ratio, our measure of a marginal effective total tax rate exhibits substantial variation among assets and industries within either the high-tech sector or the other more traditional smoke-stack sector. However, the overall average of these rates does not differ between the two sectors. This conclusion is robust to assumptions about the inflation rate, the net rate of return, the economic depreciation rates, and the debt-equity ratio.

In these calculations, the mix of depreciable assets is the only difference between the two sectors. Also, the effective tax rates are sensitive to assumptions about profitability and the source of finance for marginal investments. As a consequence, our results indicate the importance of finding out whether the two sectors differ in either of these respects.

Table 1

Marginal Effective Total Tax Rates for Each Asset

	Asset	1. 1980 Law	2. ERTA	3. TEFRA
1	Furniture and Fixtures	0.012	-0.306	0.006
2	Fabricated Metal Products	0.101	-0.278	-0.007
3	Engines and Turbines	0.169	-0.259	-0.017
4	Tractors	0.011	-0.394	0.043
5	Agricultural Machinery	0.002	-0.286	-0.003
6	Construction Machinery	0.049	-0.410	0.048
7	Mining and Oil Field Machinery	0.023	-0.397	0.044
8	Metalworking Machinery	0.148	-0.326	0.015
9	Special Industry Machinery	0.123	-0.295	0.001
10	General Industrial Equipment	0.132	-0.326	0.015
11	Office and Computing Machinery	-0.012	-0.618	0.110
12	Service Industry Machinery	0.071	-0.397	0.044
13	Electrical Machinery	0.130	-0.318	0.011
14	Trucks, Buses, and Trailers	0.058	-0.573	0.099
15	Autos	0.127	-0.388	0.057
16	Aircraft	-0.039	-0.430	0.056
17	Ships and Boats	0.213	-0.254	-0.020
18	Railroad Equipment	0.132	-0.241	-0.027
19	Instruments	0.077	-0.371	0.034
20	Other Equipment	0.053	-0.371	0.034
21	Industrial Buildings	0.475	0.376	0.376
22	Commercial Buildings	0.474	0.335	0.335
23	Religious Buildings	0.448	0.312	0.312
24	Educational Buildings	0.448	0.312	0.312
25	Hospital Buildings	0.468	0.329	0.329
26	Other Nonfarm Buildings	0.512	0.405	0.405
27	Railroads	0.277	0.194	0.266
28	Telephone and Telegraph	0.304	0.228	0.310
29	Electric Light and Power	0.295	0.221	0.301
30	Gas Facilities	0.274	0.135	0.224
31	Other Public Utilities	0.291	0.152	0.255
32	Farm Structures	0.412	0.331	0.331
33	Mining, Shafts and Wells	0.311	0.237	0.237
34	Other Nonbuilding Facilities	0.446	0.351	0.351

Table 2

The Sensitivity of Selected Effective Tax Rates under TEFRA

	Engines and Turbines	Office and Computing Equipment
Inflation		
.04	-.074	-.102
.07	-.017	.110
.10	.037	.251
Net Return		
.04	-.040	.068
.05	-.017	.110
.06	.001	.138
Investment Tax Credit		
.06	.115	.341
.10	-.017	.110
.14	-.196	-.370

Table 3

Marginal Effective Total Tax Rates for Each Industry

RANK	INDUSTRY	1980 LAW	ERTA	TEFRA
1	MOTOR VEHICLES	0.1873	-0.2002	0.0736
2	METAL CONTAINERS	0.1690	-0.2359	0.0751
3	CONSTRUCTION	0.1023	-0.3431	0.0809
4	PAPER	0.1917	-0.1450	0.0879
5	PLASTICS	0.1952	-0.1321	0.0887
6	RADIO AND TV BROADCASTING	0.1989	-0.1586	0.0893
7	AGRICULTURAL, EXCEPT LIVESTOCK	0.1179	-0.1567	0.0898
8	AGRICULTURAL, FORESTY & FISHERY SERVICES	0.1195	-0.2374	0.0905
9	TRANSPORTATION AND WAREHOUSING	0.1439	-0.2401	0.0925
10	SCREW MACHINE PRODUCTS	0.1940	-0.1767	0.0961
11	CHEMICALS	0.2022	-0.1187	0.1004
12	**AIRCRAFT AND PARTS	0.1653	-0.2097	0.1026
13	**ELECTRONIC COMPONENTS	0.2028	-0.1409	0.1033
14	PRIMARY IRON AND STEEL MANUFACTURING	0.2155	-0.1093	0.1113
15	FABRICS	0.2226	-0.0811	0.1119
16	APPAREL	0.2184	-0.0946	0.1149
17	CONSTRUCTION AND MINING MACHINERY	0.2082	-0.1331	0.1152
18	METALWORKING MACHINERY	0.2220	-0.1129	0.1153
19	STONE AND CLAY PRODUCTS	0.2073	-0.1278	0.1158
20	BUSINESS SERVICES	0.1536	-0.2476	0.1174
21	MISC. MACHINERY	0.2115	-0.1280	0.1183
22	GLASS	0.2090	-0.1172	0.1183
23	PAPERBOARD CONTAINERS	0.2080	-0.1184	0.1187
24	SERVICE INOUSTRY MACHINES	0.2141	-0.1183	0.1195
25	GENERAL INDUSTRIAL MACHINERY	0.2147	-0.1203	0.1202
26	MISC. ELECTRICAL MACHINERY	0.2194	-0.1041	0.1204
27	PRIMARY NONFERROUS METALS MANUFACTURING	0.2282	-0.0847	0.1210
28	**RADIO, TV AND COMMUNICATION EQUIPMENT	0.2146	-0.1141	0.1218
29	**OPTICAL EQUIPMENT	0.2145	-0.1254	0.1237
30	LEATHER TANNING	0.2298	-0.0876	0.1238
31	PRINTING AND PUBLISHING	0.2198	-0.0938	0.1247
32	WOOD CONTAINERS	0.2272	-0.0888	0.1253
33	ELECTRICAL INDUSTRIAL EQUIPMENT	0.2265	-0.0939	0.1261
34	OTHER METAL PROOUCTS	0.2219	-0.1091	0.1265
35	HOUSEHOLD APPLIANCES	0.2259	-0.0919	0.1269
36	ELECTRIC LIGHTING	0.2403	-0.0725	0.1274
37	RUBBER	0.2336	-0.0674	0.1275
38	FINANCE AND INSURANCE	0.1689	-0.2057	0.1277
39	MISC. FABRICATED TEXTILE PROOUCTS	0.2190	-0.1004	0.1278
40	CHEMICAL MINERAL MINING	0.1794	-0.1164	0.1294
41	FORESTRY ANO FISHERY	0.2573	-0.0396	0.1299
42	LUMBER AND WOOO PRODUCTS	0.2164	-0.1102	0.1346
43	**OFFICE AND COMPUTING EQUIPMENT	0.2336	-0.0758	0.1347
44	MISC. TEXTILE GOODS AND FLOOR COVERINGS	0.2411	-0.0438	0.1385
45	COAL MINING	0.1891	-0.0816	0.1388
46	STONE AND CLAY MINING	0.1880	-0.0952	0.1395
47	FARM MACHINERY	0.2363	-0.0718	0.1406
48	SPECIAL INOUSTRY MACHINERY	0.2407	-0.0653	0.1406
49	FOOTWEAR	0.2223	-0.0968	0.1416
50	COMMUNICATIONS	0.1967	-0.0593	0.1416
51	ENGINES AND TURBINES	0.2258	-0.0801	0.1454
52	FOOD PRODUCTS	0.2423	-0.0481	0.1462
53	MISC. MANUFACTURING	0.2466	-0.0513	0.1477
54	ORDNANCE	0.2562	-0.0247	0.1502
55	**SCIENTIFIC INSTRUMENTS	0.2450	-0.0534	0.1556
56	**ORUGS	0.2429	-0.0380	0.1589
57	HEATING, PLUMBING, STRUCTURAL METAL PROOUCTS	0.2569	-0.0325	0.1607
58	MATERIALS HANDLING MACHINERY	0.2420	-0.0514	0.1644
59	PAINT	0.2506	-0.0228	0.1656
60	AUTOMOBILE REPAIR	0.2690	-0.0334	0.1718
61	EATING AND DRINKING PLACES	0.2743	0.0239	0.1740
62	OTHER FURNITURE	0.2756	0.0139	0.1772
63	HOUSEHOLD FURNITURE	0.2786	0.0202	0.1801
64	NONFERROUS MINING	0.2466	0.0682	0.1837
65	WHOLESALE ANO RETAIL TRAOE	0.2859	0.0102	0.1897
66	LIVESTOCK	0.2450	0.0251	0.1911
67	TOBACCO	0.2845	0.0475	0.1912
68	AMUSEMENTS	0.2803	0.0426	0.1927
69	OTHER TRANSPORTATION EQUIP.	0.3029	0.0714	0.1991
70	ELECTRIC, GAS ANO WATER SERVICES	0.2396	0.0732	0.2118
71	CRUDE PETROLEUM ANO GAS	0.2870	0.1733	0.2152
72	IRON MINING	0.3214	0.1825	0.2365
73	PETROLEUM REFINING	0.3395	0.1461	0.2377
	ECONOMY MARGINAL EFFECTIVE TOTAL TAX RATE	0.2260	-0.0715	0.1382
	HIGH-TECH MARGINAL EFFECTIVE TOTAL TAX RATE	0.2178	-0.1056	0.1292

Footnotes

1. See Fullerton (1984) for further discussion of the different measures of effective tax rates.

2. With arbitrage between bonds and real capital at the firm level, the individual earns different rates of return on debt and equity as shown in equation (2). Fullerton and Henderson (1984) investigate the alternative assumption of arbitrage at the individual level. In that case, the firm must earn a higher return on equity financed investments than on debt financed investments. Neither assumption can be consistent with full equilibrium in this model with perfect certainty and one aggregate individual, but clientel effects may explain the lack of individual arbitrage in a more complete model with different individual groups.

3. The data is published in the July 1980 Survey of Current Business, and further information is provided in the Department of Commerce, Bureau of Economic Analysis, 1980, "New Structures and Equipment by Using Industries, 1972: Detailed Estimates and Methodology," Staff Paper 35 (September) Washington, D.C.: Government Printing Office.

4. See Riche et al (1983).

5. "R&D Scoreboard 1982," Business Week, June 20, 1983.

6. Our relatively high rates of tax for crude petroleum and petroleum refining may not reflect the ability of firms to expense many structural investments in oil and gas production.

7. The Tax Reform Act of 1984 raises the lifetime for structures from 15 to 18 years. Our estimates indicate that this change also makes little difference to results.

8. Weighting by gross investment increases the importance of equipment, however.

9. See Stiglitz (1973) for a view of the corporate tax as a tax on entrepreneurship.

References

Auerbach, Alan J. (1983), "The Dynamic Effects of Tax Law Asymmetries," Working Paper No. 1152, Cambridge, MA: National Bureau of Economic Research.

Auerbach, Alan J. and Dale W. Jorgenson (1980), "Inflation-Proof Depreciation of Assets," Harvard Business Review 58, 113-18.

Feldstein, Martin and Lawrence H. Summers (1979), "Inflation and the Taxation of Capital Income in the Corporate Sector," National Tax Journal 32, December, 445-70.

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

Fullerton, Don (1984), "Which Effective Tax Rate?" National Tax Journal 37, March, 23-41.

Fullerton, Don and Yolanda Kodrzycki Henderson (1984), "Incentive Effects of Taxes on Income from Capital: Alternative Policies in the 1980's," in C. Hulten and I. Sawhill, eds., The Legacy of Reaganomics, Washington, D.C.: The Urban Institute Press.

Fullerton, Don and Andrew B. Lyon (1983), "Differential Effects of the Accelerated Cost Recovery System on Investment: A Survey, with Implications for Understanding Effects on High Technology Investment," Report No. 83-GB-0007, Washington, D.C.: National Science Foundation.

Gravelle, Jane G. (1982), "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital," National Tax Journal 35, March, 1-20.

Hall, Robert and Dale W. Jorgenson (1967), "Tax Policy and Investment Behavior," American Economic Review 57, June, 391-414.

Harberger, Arnold C. (1966), "Efficiency Effects of Taxes on Income from Capital," in M. Krzyzaniak, ed., Effects of Corporation Income Tax, Detroit: Wayne State University Press.

Hulten, Charles R. and James W. Robertson (1982), "Corporate Tax Policy and Economic Growth: An Analysis of the 1981 and 1982 Tax Acts," discussion paper, Washington, D.C.: The Urban Institute.

Hulten, Charles R. and James W. Robertson (1984), "The Taxation of High Technology Industries," National Tax Journal 37, September, 327-45.

Hulten, Charles R. and Frank C. Wykoff (1981a), "Economic Depreciation and Accelerated Depreciation: An Evaluation of the Conable-Jones 10-5-3 Proposal," National Tax Journal 34, March, 45-60.

Hulten, Charles R. and Frank C. Wykoff (1981b), "The Measurement of Economic Depreciation," in C. R. Hulten, ed., _Depreciation, Inflation, and the Taxation of Income from Capital_, Washington, D.C.: The Urban Institute Press.

King, Mervyn 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: The University of Chicago Press.

Riche, Richard W. et al (1983), "High-Tech Today and Tomorrow: A Small Slice of the Employment Pie," _Monthly Labor Review_ 106, November, 50-58.

Stiglitz, Joseph E. (1973), "Taxation, Corporate Financial Policy, and the Cost of Capital," _Journal of Public Economics_ 2, 1-34.