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on
Updating Depreciable Lives: Is There Salvage Value in the Current System?

Mr. Chairman and Members of the Committee, I am Jane G. Gravelle, a Senior Specialist in Economic Policy in the Congressional Research Service of the Library of Congress. I would like to thank you for the invitation to appear before you today to discuss the issues surrounding tax depreciation policy. Although I discuss options and approaches to revision, please note that the Congressional Research Service takes no position on legislative proposals.

My discussion includes:

- How depreciation policy design affects economic efficiency.
- The development and current status of depreciation policy.
- Rigidity of the current system due to constraints on classification and lack of flexibility.
- Arguments for faster depreciation of equipment or "high tech" assets.
- Potential implications of these issues for legislative options.

Depreciation and Economic Efficiency

One of the objectives of tax depreciation policy is to prescribe rules that lead to economic efficiency, which maximizes output and welfare in the economy. If there are no reasons to favor a particular type of investment, these rules should provide equal effective tax rates across assets, so that assets are allocated in the same fashion with taxes as without taxes.

Under an income tax system, this objective means matching tax depreciation to economic depreciation (or more specifically, matching the present value of tax depreciation to the present value of economic depreciation) so that assets of different durabilities are treated equally.[1] If investment subsidies are provided they should be provided in a form that reduces the effective tax rate for each asset type by the same proportion. Investment subsidies could take the form of accelerated depreciation or investment credits. Aside from explicit subsidies provided, the value of tax depreciation can be reduced as inflation increases nominal interest rates and causes future tax deductions to be more heavily discounted. The effect of inflation on effective tax rates is more pronounced for shorter lived assets where depreciation values are more important.

As the following discussion indicates, conventional estimates of tax burdens suggest there is some favorable treatment of certain types of assets in the current system, although the depreciation rules are more even-handed now than they have frequently been in the past. Some of these differentials arise from policy choices, and others reflect certain rigidities in the present set of tax depreciation rules due to a limited number of categories and lack of administrative flexibility.

One can depart from this rule of neutrality and achieve economic efficiency if there is a market imperfection that causes under-investment in certain types of assets. Arguments, for example, have been made that assets that embody high technology should be encouraged, but this argument is not based on a market imperfection, and economic theory does not support favorable treatment of assets simply because they embody technological advance.

Development and Current Status of Depreciation

The effect of depreciation rules can be shown through construction of effective tax rates which show what fraction of the return for a new investment is paid as a tax. When the present value of tax and economic depreciation are equal, the effective rate is equal to the statutory rate; a rate above or below the statutory rate indicates tax depreciation more or less generous than economic depreciation. These tax rates assume equity finance and consider the tax burden at the level of the firm. (Debt financed assets generally have negative tax rates due to the deduction of interest, when tax depreciation is more generous than economic depreciation.)

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[1] Note, however, that even with tax and economic depreciation equated, which eliminates differentials across business assets of different durabilities, there are other tax differentials in the system, including favorable treatment of owner-occupied housing, and differentials between business sectors (corporate and non-corporate) and types of finance (debt finance is favored).

Before 1954, shorter lived assets (equipment) were taxed more heavily than buildings, but during the period 1962-1985, investment subsidies for equipment reversed that relationship.[2] In 1981, when equipment and structures respectively were largely assigned to a single class, all tax burdens were lowered substantially and equipment investment was actually subject (prospectively) to negative tax rates.

The Tax Reform Act of 1986 produced a more neutral system, although tax rates on structures were still, on average, slightly higher than tax rates on equipment. A decision was made in 1986 not to index the capital income tax for inflation, and therefore depreciation rates were accelerated relative to economic depreciation, but those faster rates roughly offset the effects of inflation. In addition, the 1986 changes still classified assets in a very few categories, so that there was some variation across equipment as well.

The gap between tax rates on structures and equipment subsequently increased, reflecting both legislative changes and a fall in inflation rates. The 1993 tax legislation increased the corporate tax rate by a percentage point, a neutral change, but also increased the tax life of nonresidential structures from 31.5 years to 39 years. These higher overall tax rates were offset by the effects of a decline in the inflation rate, but that decline benefitted equipment relative to structures.

Tables 1 and 2 show the tax rates for equipment and structures, both disaggregated by type, and with equipment aggregated into an average, for 1986 law assuming 5% inflation, for 1993 (current) law assuming 4% inflation, and for 1993 (current) law with lower (2%) inflation).[3] These tables use estimates by Hulten and Wykoff,[4] which were the basic economic depreciation rates that were available during consideration of the Tax Reform Act. Assets in **table 1** are arrayed in order of durability, with the shortest-lived assets at the top. These tables show that some variation remains in equipment tax rates, but most equipment is taxed at rates below the statutory corporate rate of 35%.

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[2] Historical tax rates are presented in Jane G. Gravelle, "Whither Tax Depreciation?" *National Tax Journal*, Vol. 54, Sept., 2001, p. 514.

[3] Details on the construction of these tax rates can be found in Jane G. Gravelle, *The Economic Effects of Taxing Capital Income*, Cambridge, MIT Press, 1994.

[4] Charles Hulten and Frank C. Wykoff. "The Estimation of Economic Depreciation using Vintage Asset Prices: An Application of the Box-Cox Power Transformation," *Journal of Econometrics*, Vol. 5, April, 1981, pp. 367-396.

Table 1: Effective Tax Rates, Tax Reform Act of 1986 and After (by Law, Inflation Rate)

Asset Type	1986 Law, 5%	1993 Law, 5%	1993, 2%
Autos	41	42	35
Office/Computing Equipment	37	38	31
Trucks/Buses/Trailers	35	36	30
Aircraft	35	36	30
Construction Machinery	29	30	24
Mining/Oilfield Equipment	34	35	29
Service Industry Equipment	34	35	29
Tractors	32	33	27
Instruments	33	34	29
Other Equipment	32	33	27
General Industrial Equipment	30	31	27
Metalworking Machinery	29	29	24
Electric Transmission Equipment	38	39	36
Communications Equipment	23	24	19
Other Electrical Equipment	29	30	24
Furniture and Fixtures	28	29	23
Special Industrial Equipment	26	27	21
Agricultural Equipment	26	27	21
Fabricated Metal	34	35	29
Engines and Turbines	40	42	36
Ships and Boats	28	29	24
Railroad Equipment	22	23	18
Mining Structures	12	13	12
Other Structures	41	43	41
Industrial Structures	38	40	36
Public Utility Structures	30	31	30
Commercial Structures	35	37	35
Farm Structures	29	30	29

Source: See text.

Table 2. Effective Tax Rates, by Asset Type (Effects of Law Changes and Inflation)

Year	Equipment	Factory	Office Building	Apartment
1986	32	38	35	34
1993 (5% inflation)	33	41	38	35
1993 (2% inflation)	27	38	35	31

Note: Apartment buildings are assumed to have the same economic depreciation rate as office buildings (2.47 % using a geometric rate). Factory buildings are assumed to have a 3.61 % geometric depreciation rate. The average depreciation rate (weighted by capital stock shares) for equipment is 15%.

Table 2 compares rates for equipment as a whole with specific buildings, and includes residential structures as well. These rates suggest that structures are taxed more heavily than equipment, an argument also made by the Treasury Department.[5] Overall, tax rates on equipment (the top 22 categories in **table 1**) fell from 32% in 1986 to 27%. Residential structures were taxed at slightly lower rates than nonresidential structures, assuming similar depreciation rates, because their slightly shorter (27.5 year) lives were not increased. The tax rate on factory buildings is estimated to be slightly higher than the rate on apartment buildings because factory buildings are estimated to depreciate at a slightly faster rate, but the differences are small.

Some of these economic depreciation rates have been re-estimated and this issue may be important for assets that are changing substantially over time (such as office computing equipment). I defer a discussion of these updated estimates to the section on depreciation of "high tech" equipment.

Rigidities in the Current System

The depreciation system has not been changed since 1993, more than a decade ago, and that change involved only a lengthening of lives for structures largely as a revenue offset measure. The rigidity of the system arises from two interrelated causes: the decision to use only a limited number of classes, and the removal of the authority of the Treasury to assign class lives in 1988. Having a limited number of classes means that, even if assets can be properly assigned to their classes, there will be differences in effective tax rates. As an illustration, consider the first, second, third, and fifth assets in **Table 1**, which are assigned to the five year class. The effective tax rates range from 35% to 24%. The majority of assets fall into the seven year classes which results in a tax rate as high as 29% for mining equipment, but as low as 21% for agricultural equipment. More class lives would permit a

[5] U.S. Department of Treasury, *Report to the Congress on Depreciation Recovery Periods and Methods*. July 2000.

more uniform set of tax rates. Nor is it likely that adding more classes would add much in the way of complication, since the challenge is how to assign assets, rather than how to calculate depreciation (which is relatively straightforward). At least one reason for retaining the limited number of classes in 1986 might have been a desire not to depart too dramatically from the existing 10-5-3 set of classes for equipment, by simply adding three more categories (7, 15, 20). But there is no obvious reason for not refining the system by adding more classes.

A second problem is the loss of flexibility in the system since the Treasury, with legislation passed in 1988, no longer has the authority to reclassify assets. That problem, and others, including lack of research on depreciable lives, led Neubig and Rhody[6] to argue that the current system is flawed, especially in creating high tax rates for technologically advanced equipment. In particular, they suggest five types of misclassification problems: new assets may be put incorrectly into existing classes, they may be assigned the default class of seven years, they may have changed in a technological sense, they may be assigned incorrect lives because they are classified by industry, and they may be assigned different classes for different taxpayers.

Arguments for More Generous Treatment of Equipment or "High Tech" Assets

A persistent theme in the development of the tax system in the post war period, to which the 1986 Tax Reform Act was an exception, was the tendency to propose and adopt investment subsidies that largely targeted equipment. An example was the investment tax credit. Such proposals were sometimes made for short term stimulus reasons (as were the recent provisions allowing bonus depreciation). But some equipment investment subsidies were enacted on a permanent basis. Arguments and proposals for more generous depreciation of equipment in general, and for "high tech" equipment in particular, are made currently, even though the effective tax rate analysis indicates that equipment is already favored relative to structures.

There are two different types of arguments made to support more generous treatment for these types of assets. The first is an argument that these assets are more "productive" or embody more recent technology, and we need to expand investment of this type to achieve economic growth. But this argument does not stand up to economic reasoning: if assets are more productive, investments will be made in them by private markets to the point (assuming tax neutrality) that their return is equated to those of other investments. Growth models that employ vintages of capital with different embodied technology show the same sort of steady state growth characteristics as other growth models and provide no rationale for favoring assets because they embody more technology.

The other argument is potentially more legitimate: new, "high tech" assets have higher depreciation rates than those depicted in the effective tax rate measures or that guided the setting of depreciation rules in the 1986 Tax Reform Act. Some of these proposals would allow expensing of high tech assets, such as computers, on the grounds that computers must be replaced very quickly.

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[6] Thomas S. Neubig and Stephen E. Rhody. " 21st Century Distortions from 1950s Depreciation Class Lives." *Tax Notes*, May 29, 2000, pp. 1267-1273.

There are several reasons that these arguments should be greeted with some skepticism. There is on-going research into updated depreciation rates, but in general these studies have not found dramatic differentials between the economic depreciation rates used to formulate the 1986 rules and those that might be appropriate today, even for assets such as computers. Hulten and Wykoff's[7] updated estimates in 1996 showed most rates to be similar, although they did increase the rate for electrical equipment from 0.11 to 0.18; tax rates would rise for these assets (electrical transmission equipment, communications equipment, and other electrical equipment) by about five percentage points. A few other tax rates would rise and fall by about a percentage point, but on the whole the overall effective tax rate was about the same (28% rather than 27%). Oliner's[8] 1996 study of metal working machinery which did account for a later time period, however, found a lower rate of 0.095 for metal working machinery, resulting in a tax rate of 21% for that asset.[9] Fraumeni[10] reports on the economic depreciation rates used in the National Income and Product Accounts (NIPA) which relies heavily on the Hulten and Wykoff numbers, but includes updated estimates where available. The effective tax rates using the original Hulten and Wykoff numbers that were available in 1986 and the NIPA numbers are reported in **Table 3**. Overall these numbers suggest lower effective tax rates, and, in a few cases, some significant changes. Overall, however, effective tax rates for equipment are slightly lower, at 25%, than those based on the original Hulten and Wykoff numbers alone. And while tax rates on office equipment and computers have changed somewhat, the consequences for effective tax rates are minor.

There have been a few updates subsequent to this table, but again, these changes do not dramatically alter the effective tax rate picture, and in some cases lower it. A new study of personal computers indicated a depreciation rate of about 32%, leading to a tax rate of about 34%, or about the statutory rate.[11] Updated NIPA estimates further lowered the depreciation rate for aircraft to 6.6% which would produce an effective tax rate of about 17% and lowered the depreciation rate for light trucks to 19.25%, producing a tax rate of about 22%.

Moreover, to the extent this concern about "high tech" equipment is directed towards short-lived assets, there is an automatic protection from being overtaxed, because the remaining value of the asset (net of salvage value) can be deducted on disposition. For example, suppose an asset lasts for two years and then disappears in value entirely. Simply calculating the effective tax rate using the full five- or seven-year write-off would result in

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[7] Charles Hulten and Frank C. Wykoff, "Issues in the Measurement of Economic Depreciation." *Economic Inquiry*, Vol. 34, Jan., 1996, pp. 10-77.

[8] Stephen D. Oliner, "New Evidence on the Retirement and Depreciation of Machine Tools," *Economic Inquiry*, Vol. 34, Jan.,1996, pp. 57-77.

[9] Hulten and Wykoff's alternative estimates for non-residential structures were about the same as before, 3% for a 36% tax rate. Similar rates were found for structures by Deloitte and Touche, *Analysis of the Economic and Tax Depreciation of Structures,* Washington, D.C., June 2000.

[10] Barbara Fraumeni, "The Measure of Depreciation in the U.S. National Income and Product Accounts," *Survey of Current Business*, Vol. 77, July, 1997, pp. 7-23.

[11] Mark Doms, Wendy Dunn, Stephen Oliner, and Daniel Sichel, "How Fast do Personal Computers Depreciate? Concepts and New Estimates" *Tax Policy and the Economy,* vol. 18 (2004), pp. 37-79. Estimates in Michael J. Geske, Vaklerie A. Ramey and Matthew D. Shapiro, "Why Do Computers Depreciate?" Working Paper Dec. 23, 2004 are similar but somewhat lower.

an effective tax rate of 47% and 61% respectively. However, with a deduction on discard, the effective tax rate for the five-year life would be 39% and for the seven-year life 43%.

Table 3: Comparison of Effective Tax Rates Using Hulten and Wykoff and NIPA Depreciation

Asset	Economic Depreciation Rates	Alternative Depreciation Rates*	Effective Tax Rates	Updated Effective Tax Rates
Autos	0.3333	0.28	35	31
Office/Computing Equipment	0.2729	0.31*	31	33
Trucks/Buses/Trailers	0.2535	0.1725	30	24
Aircraft	0.1818	0.0825**	30	19
Construction Machinery	0.1720	0.1550	24	22
Mining/Oilfield Equipment	0.1650	0.1500	29	27
Service Industry Equipment	0.1650	0.1650	29	29
Tractors	0.1633	0.1633***	27	27
Instruments	0.1473	0.1350	29	27
Other Equipment	0.1473	0.1473	27	27
General Industrial Equipment	0.1225	0.1072	27	24
Metalworking Machinery	0.1225	0.1225	24	24
Electric Transmission	0.1179	0.05	36	23
Communications Equipment	0.1179	0.15	19	22
Other Electrical Equipment	0.1179	0.1834	24	22
Furniture and Fixtures	0.1100	0.1179	23	24
Special Industrial Equipment	0.1031	0.1031	21	21
Agricultural Equipment	0.0971	0.1179	21	24
Fabricated Metal	0.0917	0.092	29	29
Engines and Turbines	0.0786	****	36	****
Ships and Boats	0.0750	.0611	24	22
Railroad Equipment	0.0660	.0589	18	17

* This is a typical rate. Actual rates range from 0.27-0.35 for mainframes, terminals, storage devices and printers; other office equipment is assigned a 0.31 rate. Personal computers are assigned a lower rate of 0.11 but there is some uncertainty about this rate. Photocopy equipment is assigned a life of 0.18.

** Rate for commercial aircraft and business services. Other aircraft are assigned a rate of 0.11.

*** Rate for construction tractors. The economic depreciation rate for farm tractors is slower and the tax rate would be a little lower.

****Two widely disparate rates are reported in this category, 0.0516 for steam engines and 0.2063 for internal combustion engines. Presumably this category is dominated by the former, and for these assets the rate is 31%.

In addition, the investment distortion that arises from potentially overtaxing a very short lived asset is very small because the rate of return is less important to the economic cost of using these assets.[12]

Note, however, that the analysis above concerns broad categories of assets. The discussion does not mean that there are not specific cases of assets that are misclassified, and that might be placed into a more appropriate class with a more flexible system.

Policy Issues

Compared with the depreciation regime that has existed in the past, the current depreciation system is relatively neutral and is functioning well. The expansion of differentials between structures and equipment is due in part to explicit legislative changes. Differentials across equipment types are inevitable when the number of asset classes is limited, but even in these cases, the differentials are not dramatic.

There are two types of options for change in the current system that might be considered. One is to alter the process, by allowing more administrative flexibility on the part of the Treasury Department in the assignment of an asset to a class, or the reassignment of assets to different classes based on ongoing technological and economic developments. If such a change were made, there may be a need to explicitly direct the Treasury Department to undertake studies of economic depreciation to inform the process. Currently, most research that has been undertaken to study depreciation has been done by academics, and there may be a need to ensure some more systematic study. Neubig and Rhody have suggested that such research be undertaken by industry, with Treasury Department review. This approach is somewhat problematic given that the incentives are to find short useful lives, but may be useful in cases where the only data are proprietary. Another agency of the government with a need for reliable economic depreciation rates is the Bureau of Economic Analysis.

Another option is to make explicit legislative changes. These might include provisions to bring the tax rates on structures and equipment closer together by shortening the life for structures (for example, returning to the pre-1993 depreciable lives, or assigning business structures the shorter lives of residential structures). The tax rates could also be brought closer together by increasing the tax lives for equipment. Legislative changes might also include expansion of the number of classes to reduce the variation across equipment categories. They might also reassign assets, based on new evidence about economic depreciation rates, if regulatory authority to do so is not granted.

More dramatic proposals have included those to expense some or all of equipment assets. Expensing of assets is part of a step toward a consumption tax base, which could achieve neutrality across investments of different durabilities by imposing an effective tax rate of zero. But a narrowly targeted expensing provision will expand the differentials

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[12] One can think of the cost as the rent the firm would pay to use the asset. For a short lived asset, (e.g. rental of a car) most of the rent is to cover the return of the original cost, while for a long lived asset (e.g. an apartment rent) which depreciates very slowly, much more of the cost is the return to the asset, or the interest rate.

between equipment and structures. Moreover, expensing provisions will create overall negative tax rates on assets that are financed by debt, since the deduction for interest eliminates the tax at the firm level with economic depreciation (and produces a negative tax at the firm level when inflation is present, because of the deduction of nominal interest). A true move to a consumption tax would require a series of major changes in the tax code, which could be very disruptive and difficult to implement. In order to avoid negative tax rates, interest should not be deducted at the firm level and should not be included in individual income. Other changes would be necessary if a large revenue loss is to be avoided.[13]

[13] The least radical and least complex set of changes would lead to a system similar to the flat tax. These changes would include in addition to expensing physical investments and eliminating taxes on interest income and deductions the following: eliminating taxes on dividends and on capital gains on the sale of financial assets, taxing the gain on the sale of physical business assets at full rates, and disallowing deductions for the cost of existing assets, inventory, and basis.