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# The Relation of Depreciation Provisions to Replacement

BY GEORGE O. MAY

“RE-INVESTMENT of part of the present depreciation allowances will maintain productive capacity. Business can invest all of its depreciation allowances only by expanding its productive capacity.”<sup>1</sup>

If this statement, which appears in the testimony of Dr. Oscar L. Altman before the Temporary National Economic Committee, could be shown to be well founded, it would be of great importance to the accounting profession as well as to the political economist. It is so contrary to the general opinion of accountants that it would seem to be worth while to examine the testimony with a view to seeing on what basis it rests.

Dr. Alvin H. Hansen, in his testimony, made a more guarded statement, putting forward as a potentiality what Dr. Altman put forward as a fact. He said:

“. . . you can have in modern times a perfectly enormous increase in your productive capacity merely by renewing your plant and equipment, merely by expending your depreciation allowances and not tapping a cent of savings; you can have very great progress” (page 359).

Dr. Hansen cited no statistical evidence to support his view; Dr. Altman presented a considerable number of statistical exhibits, but they are, in the main, based on misinterpretations of studies of Dr. Kuznets and Dr. Fabricant of the National Bureau of Economic Research, and in any case fail to support the conclusions drawn from them, so that it would seem unnecessary to consider them in detail (see appendix).

It may, however, be worth while to

<sup>1</sup> Vol. 3, page 426.

consider to what conclusion the statistical evidence before them really points. It must be recognized that such statistics are, at best, rough approximations. Dr. Fabricant<sup>2</sup> says: “The economist, in estimating business facts, need not have the scruples of the accountant. The accuracy he strives for is related to a wider view.” First, however, it is necessary to broaden our consideration of the question.

Dr. Hansen and Dr. Altman attributed the situation which they thought to exist to two factors: lowered price levels, and technological progress. They seemed to assume that their conclusion would be established if they could show that technological progress and falling prices made it possible to replace equipment at a cost per unit of efficiency or capacity lower than that of the unit replaced.<sup>3</sup> In doing so, they ignored two important antecedent questions:

- (1) Are existing depreciation provisions sufficient for the purpose for which they were originally intended; namely, to amortize the cost of existing units, less salvage, over their estimated useful life?
- (2) Do substantially all depreciation and depletion allowances become available either for replacing units or for returning the capital represented thereby?

<sup>2</sup> *Capital consumption and adjustment*, page 193.

<sup>3</sup> Depreciation provisions provide some funds available for expansion when investment is increasing. It is of the essence of the system that it provides for retirements before they occur. Thus, a revolving fund is created which increases with new investment and the net accretions (not the gross credits) to this fund may be regarded as available for new capital investment. But this is not the point Dr. Hansen and Dr. Altman were discussing.

They also ignored the effect of an acceleration of technological progress on the life of existing units and hence on the amount of accumulated provisions for depreciation.

1. ADEQUACY OF CURRENT DEPRECIATION PROVISIONS

Dr. Fabricant's volume contains the following tables which bear directly on this question:

Table VIII, page 271, shows the gross capital assets as appearing in balance-sheets accompanying income-tax returns for 1934, specially tabulated by the Bureau of Internal Revenue.

From this table it appears that the total capital assets of all companies, excluding land, were approximately \$123 billion. This total includes assets subject to depletion as well as depreciable assets. A significant fact is that transportation and other public utilities accounted for \$57.5 billion of this total and finance and real estate for a further \$12 billion, while all manufacturing represented only slightly less than \$33 billion. The predominance of utilities and real estate investments in the total would in itself lead an accountant to question whether depreciation provisions were, in the aggregate, sufficient for the purpose for which they are designed.

Tables 1 and 3 (pages 32, 38) show the totals of business depreciation and depletion charges for 1934 by industries, the aggregates being \$3,943.4 million for depreciation and \$322.2 million for depletion. These totals include the figures for unincorporated business aggregating for depreciation and depletion combined \$591.6 million (Table IV, page 263). We can roughly assume this to include depreciation of \$580 million.

In attempting to make comparisons between the figures thus available we encounter certain difficulties.

First, capital assets include intangibles. Fabricant estimates these at 5 per cent and we can accept his estimate and

assume that depreciation provisions include nothing for intangibles.

Second, provisions for retirement or replacement of railroad property other than equipment are usually dealt with at the time of retirement, and not through depreciation accounts. We can meet this difficulty by excluding railroads from our calculation.

Third, there is no subdivision of capital assets between those subject to depletion and those subject to depreciation. Of the total depletion, \$185 million was claimed by mining and quarrying companies and we might exclude this group also from our calculation, treating the depletion allowed to other companies as if it were depreciation. Or we can assume that the percentages to capital assets of depletion and depreciation are roughly the same. (This could hardly result in serious error, since depreciation and depletion for mining and quarrying companies is 4 per cent, while for all manufacturing groups it is 4.3 per cent.) (Table 2.)

Whichever method we employ we shall find that the average rate of depreciation on capital assets (excluding intangibles) for all industry except railroads, is under four per cent.<sup>4</sup> If all public utilities were excluded (capital assets \$57.5 billion, annual depreciation \$968 million), which might be reasonable on the ground that they have a concept of depreciation somewhat different from that commonly adopted in manufacturing and industry and therefore should be treated separately, we should still find that the average rate on the remainder was not more than five per cent.

Table 33, page 181, gives the classification of capital goods produced in 1929 according to the length of their expected useful life, these lives in turn being estimated mainly on the basis of

<sup>4</sup>For convenience the essential figures follow:

	Capital Assets	Annual Depreciation
All Companies	\$123 Billion	\$3,363.4 Million
Steam Railroads	26 "	160 "
Mine and Quarries	8 "	185 "

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figures contained in the Treasury study, *Depreciation Studies—Preliminary Report of the Bureau of Internal Revenue, 1931*. From this table an over-all rate of depreciation can be computed. Since Kuznets in his study of capital formation treats only goods having a life of over three years as durable goods, we may draw the same line in our calculation. We shall then find that the over-all rate of depreciation indicated by this classification of assets having a life of more than three years is almost exactly  $7\frac{1}{2}$  per cent. This table deals, of course, only with depreciable assets—not with natural resources, which are subject to depletion charges.

A comparison of this percentage with the percentages above derived from tables 1, 3, and VIII suggests a great inadequacy in actual depreciation provisions. Probably it exaggerates the actual discrepancy. The elements of uncertainty are many and important. Fabricant's classification of expenditures by life terms may be open to question; much also depends on what expenditures are capitalized and depreciated, and undoubtedly there is a wide variety of practice on this point. It is perhaps sufficient to say that the comparison affords a strong indication that depreciation rates are inadequate. The classification by life terms has a further interest in relation to the time element in the effect of technological progress, to which reference will be made hereafter.

### 2. IS ANY CONSIDERABLE PROPORTION OF DEPRECIATION PROVISIONS UNAVAILABLE FOR REPLACING UNITS OR RETURNING THE CAPITAL REPRESENTED THEREBY?

This question is strikingly suggested in an article which appeared in *Harper's* magazine for February dealing with the testimony of Dr. Hansen and Dr. Altman. In that article (to which attention was called in your editorial columns), the author took as an illustration of the working of depreciation

schemes the case of the Empire State Building Company making an annual charge for depreciation of \$1.65 million in respect of a depreciable investment of \$99 million. "This means," he says, "that the Company owning the building must set aside \$1.65 million out of its income every year. At the end of sixty years it will have \$99 million on hand."

But will it? Almost certainly not if, as the evidence before the Temporary National Economic Committee shows, the Company has been unable to earn seven-tenths of one per cent on an investment of \$100 million with which to pay interest. Book entries for depreciation in such a case may be regarded as recognition of an unpleasant fact or as an idle gesture—they will certainly produce no money for replacement if the company has no income from which a depreciation provision can be set aside.

How important this element of the problem is in relation to the economy as a whole it is not easy to say, but that the importance is great is indicated by the statistics of income, which show to what extent depreciation deductions have been claimed by companies which had, and by those which did not have, net income.

For the seven years ending with 1935, these statistics show that of the corporate claimants of depreciation or depletion, 64 per cent had no net income. Of the total amount of depreciation and depletion claimed, 46 per cent was claimed by these companies.

The fact that a corporation had no net income for a year does not necessarily mean that no effective reservation of funds is ever made in respect of its depreciation provisions for that year. In these years, dividends from other corporations are excluded from income and some companies may, as the result of dividend receipts, have had gross income sufficient to meet depreciation and depletion provisions.

In other cases, the deficit for the year may have been less than the depreciation

provision, in which event a part of that provision may be regarded as set aside during the year. Again, if the deficit for the year has been made good out of subsequent earnings before any distribution of dividends occurs, the depreciation provisions of the earlier years will have been effectively set aside.

On the other hand, if the deficit has been charged against a previously existing surplus, or if accumulated deficits are ultimately extinguished through reorganization or bankruptcy, the depreciation provisions which have merely increased the amount of those deficits will never be represented by any actual provision of funds. In view of the number and importance of the bankruptcies and reorganizations that have taken place in the last decade, it is manifest that the amount of provisions which never became effective must be very substantial, though there is no readily available statistical means of computing the amount.<sup>5</sup>

The point we are discussing may be further illustrated from the case of the United States Steel Corporation, on which much emphasis was laid in the testimony. The recently published report of that Company shows the essential facts in convenient form in a table on page 10. From those figures it will be seen that during the decade of the 1930's the Company set aside as current depreciation provisions a total of \$510 million, and that during the same period it had a deficit after dividends of \$190 million which was charged quite properly against the surplus of the previous years. During this period,

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<sup>5</sup> The enterprises which go into bankruptcy or are reorganized may continue, but the new owners will not provide out of their earnings for the depreciation which their predecessors recognized but made no financial provision for. They will probably revalue the properties and if they spend money on rehabilitating them will capitalize those expenditures. For tax purposes they may continue to take depreciation on original costs, in which case depreciation may figure in statistics of income which does not appear in the accounts of the taxpayer.

therefore, it may be said that only 63 per cent of its depreciation provisions resulted in an effective setting aside of funds available for financing replacements or extensions.

At this point it is clear that apart from the effect of technological progress and changes in price levels the amount made available through depreciation provisions would be quite inadequate to provide for the maintenance of the country's capital investment.

The extent of this inadequacy is, perhaps, less than the statistics suggest for a number of reasons. Some have already been noted. Another is the practice of charging to maintenance accounts expenditures which should theoretically be charged against provisions previously made for depreciation. This is particularly likely to occur when depreciation provisions are recognized as being inadequate but are continued unchanged because of tax or other considerations, and also when profits are satisfactory.

The line between charges to depreciation accounts and to maintenance on the one side, and between charges to depreciation and charges to capital account on the other, is indefinite and necessarily to a considerable extent arbitrary, with the result that a somewhat different treatment of the same physical facts will result in a different distribution of the charges. For instance, a classification may require that repairs be charged to maintenance but extraordinary renewals against depreciation; or an arbitrary limit may be made below which all charges are to go to maintenance. In such cases, a number of repair jobs may be undertaken separately and charged to maintenance, or they may be accumulated into a single operation and charged against the depreciation provision.

Where events seem to prove that provisions for depreciation are more than adequate for the purpose for which they were originally designed, it will perhaps

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more often than not be found that the excess is really due to the fact that some of the expenditures which they were designed to cover have not been charged against the provisions but against maintenance.

#### 3. EFFECT OF TECHNOLOGICAL PROGRESS

Technological progress may operate in one or more ways: (1) it may make it possible when replacement is due to replace the existing unit by one of equal capacity and efficiency at a substantially lower cost; (2) it may make it possible when replacement is due to substitute a machine of greater efficiency or capacity; (3) it may make the existing unit prematurely obsolete and necessitate replacement in advance of the contemplated date.

Dr. Hansen and Dr. Altman appear to have considered mainly the case of replacement at lower cost, but it seems not unlikely that this is the least important of the three ways in which technological progress has affected the adequacy of depreciation provisions. There seems to be reason to suppose that the emphasis in recent years has been towards securing through replacements lower production cost or improved quality rather than additional capacity. Dr. Sumner H. Slichter, in his article in the November *Atlantic Monthly*, stresses this tendency, saying:

“Technological change, however, has been increasing the amount of capital

that can be advantageously used per worker. It is three times as large as it was in 1880, in dollars of constant purchasing power, and it may be expected to grow.”

The most important element in the problem is, perhaps, the time element; that is, the relation between the time elapsed when technological progress makes replacement necessary, and the estimated life implicit in the determination of the depreciation provision which is being made. If a unit with an estimated life of thirty years and no salvage value is replaced by a unit costing two thirds of the original cost of the unit replaced, the depreciation provision available will be sufficient to finance the replacement if it occurs after the expiration of twenty years, but not if it occurs prior to that date.

In view of the importance of this element of the problem it seems worthwhile to consider the life terms implicit in current depreciation charges. For this purpose it appears to be desirable to classify capital assets into three rough groups: long-lived, medium-lived, and short-lived. Technological progress is not likely to affect materially the replacement cost of the class of units with short lives, nor is it likely to have much effect on the length of their lives. In the case of long-lived assets its effect may be very considerable in either or both respects. From Fabricant's table 33 above referred to we can derive a table such as the following:

Estimated life	Per cent of total investment	Per cent of annual depreciation	Average depreciation rates
10 years and under but over 3 <sup>6</sup> . . . . .	26%	54%	16%
20 “ “ “ “ “ 10 . . . . .	36	31	6
Over 20 . . . . .	38	15	3
	—	—	—
	100	100	7.5

<sup>6</sup> I have excluded property with a life of three years or less because such expenditures are not treated as “durable goods” in the statistics of Dr. Kuznets. However, a considerable amount of depreciation is undoubtedly in respect

of property of this type. For instance, while General Motors charges to operations its tooling expense in connection with new models, these items are handled by Chrysler Corporation through its depreciation reserves (with a life of

But current provisions are certainly not more than 5 per cent. We can estimate roughly the lives implicit in an over-all rate of 5 per cent instead of  $7\frac{1}{2}$

per cent by increasing the lives in the foregoing table by 50 per cent.<sup>7</sup> Our table then becomes:

Estimated life	Per cent of total investment	Per cent of total depreciation	Average depreciation rates
15 years and under but over $4\frac{1}{2}$ . . . .	26%	54%	$10\frac{1}{2}\%$
30 " " " " " 15 . . . .	36	31	$4\frac{1}{4}$
Over 30 . . . . .	38	15	2
	100	100	5

It will be observed that the greater part of the annual depreciation is in respect of property for which a comparatively short life is estimated, the replacement cost of which would naturally be less influenced by technological progress than property for which a longer life is anticipated.

Turning to the longer lived classifications; if we are depreciating on the assumption that three eighths of our property (excluding that of utilities) has a life of over thirty years, and another three eighths a life of between fifteen and thirty years; and if, further, we assume that technological progress is rapid, it is surely inevitable that replacement will normally occur before depreciation provisions have equalled the cost of the unit replaced. Such a conclusion would, I think, be in accord with the general impression of accountants. It should be borne in mind that the Bureau of Internal Revenue in general has recognized obsolescence as a factor in depreciation only to the extent that it is practically inevitable, and has insisted that extraordinary obsolescence, due to unexpectedly rapid technological progress or other conditions, shall be taken as a loss only when it is actually determined.

about two years) and in 1938 accounted for roughly one half of the depreciation charges (of \$15,000,000) of that Company. This difference illustrates the importance of classification of expenditures in relation to the rates and adequacy of depreciation charges. What is charged against such provisions is little less important than what is credited to them.

I see no reason to believe that technological progress is remedying the condition of inadequate depreciation indicated in the two preceding sections of this discussion.

#### 4. THE EFFECT OF CHANGES IN THE PRICE LEVEL

This element in the situation hardly needs discussion because the assumptions of Dr. Hansen and Dr. Altman appear to have been contrary to the fact. Correctly construed, Fabricant's figures show that the price level of 1936 and 1937 was actually higher than the price levels underlying the depreciation provisions made in that year. Only in a brief period, from 1931-1935, was the price level for replacements even slightly below the price level underlying the depreciation charges of the same years. It may be added that this conclusion is based on Fabricant's assumptions as to the life terms on which depreciation charges are based. If, in fact, we are depreciating on implicitly assumed longer lives, then a larger portion of the depreciation charges now being made is based on the lower price level that existed a quarter of a century ago, and the price level today is correspondingly

<sup>7</sup> Over-all rates require cautious handling, and in order to convert an over-all rate of  $7\frac{1}{2}$  per cent into one of 5 per cent it is not necessary to assume the same increase of estimated life for all assets. I am satisfied, however, that no alternative way of accomplishing this result will produce conclusions differing from those herein reached.

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higher in relation to the cost of the assets being depreciated.

### 5. CONCLUSION

The conclusion reached from a study of the evidence on which Dr. Altman based his testimony seems to me to be that there is nothing in it to indicate that current depreciation provisions are excessive. On the contrary, it suggests that those provisions are inadequate to provide either for the amortization of capital invested therein or for the replacement thereof when replacement becomes necessary. This conclusion is, I think, one which most accountants would draw from their own practical observation and experience. It would not, I believe, be changed by a more de-

tailed analysis of available information.

A further question may be raised whether, from the standpoint of the national economy, provisions should be regarded as adequate which do no more than maintain a previously existing standard of efficiency and production. From the standpoint of the individual producer, acceptance of such a hypothesis would involve disaster. He must operate on the assumption that we live in a world of progress and that maintenance and depreciation must not merely conserve an existing standard, but provide for the preservation of the same relative position in an advancing economy. As the Queen told Alice, it is a slow sort of country [or economy] in which you can remain where you are without moving.

### APPENDIX

For the benefit of those who wish to pursue the question further, some of Dr. Altman's misconceptions may be noted.

The figures which appear in Dr. Altman's exhibit 576 are, as there stated, figures of capital consumption (estimated primarily on the basis of depreciation provisions). They are not estimates of replacement outlays and, moreover, since they include farm consumption, are inappropriate in a study confined to industry. Dr. Altman misstated their character when he said (page 423), in answer to a question by Mr. Henderson, that they represented the percentage of construction that "went for replacement purposes during the period."

If Dr. Altman were correct in assuming that 65 per cent of all capital expenditures during the years 1923-1929 went for replacements, the fact would go far to prove, first, that depreciation provisions were inadequate, not excessive. Further, since it would mean that only 35 per cent of the total was for additions, it would imply that industry

derived the major part of its finances *for additions* from the market.

Dr. Altman errs in concluding from exhibit 577 that depreciation charges during the 1920's were becoming relatively higher than before. The mistake appears to have arisen largely from using figures which in the earlier years exclude, and in the later years include, depletion. Actually, according to Fabricant, the percentage of depreciation provisions to investment was remarkably steady during the period and actually slightly lower in 1929 than in 1920.

The adjustment of Fabricant's figures in Dr. Altman's exhibit 582 is misconceived and unwarranted, as will be at once apparent to a trained statistician. When it is reversed, a rise in prices in 1936 and 1937, as compared with 1929, is disclosed.

Dr. Altman errs in stating that "current assets are usually financed by current liabilities" (page 423). The statement is controverted by his own exhibit 587, and doubtless led to the unexplained inventory adjustment for 1930, 1931, and 1932 in exhibit 586.