Profits for Economists

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Abstract: There is no single best estimate of profits because different purposes require different measures. For example, profits in national income should be different than profits in financial statements. But given these differences, there are certain economic standards that should apply to all profit measures. These standards are described and then used to evaluate the appropriateness of several currently available measures of profits including those reported by the National Income and Product Accounts, Internal Revenue Service, Quarterly Financial Report, Compustat, and *Business Week*.

Few concepts are as indispensable to economics as profits. From introductory texts to abstruse mathematical models, profits are at the center of many economic questions. But the fact that a concept is ubiquitous does not necessarily mean that it has been clearly defined or measured. The purpose of this essay is to explore what profits are and how they should they be measured from an economic perspective. The second section evaluates the appropriateness of several available profit measures.

The virtue of simple definitions is that they are rarely disputed. Few economists would object to the definition of profits as the difference between total revenue and total costs. But what simple definitions gain in generality they often lose in application. This definition, for example, provides us with little guidance in

resolving the multitude of specific questions and issues that surround the actual problem of calculating profits.

One should be forewarned that the search for a single correct way to measure profits is an act in futility. There is no more a single correct measure of profits than there is a single correct measure of unemployment, budget deficits, or national savings. But all is not chaos either. If one is explicit about the purpose of a particular concept, it is possible to come up with a reasonably appropriate measure.

The common approach in this field of work is to outline a theoretical ideal and then note the concessions that must be made to the real world and available data. Economists are inclined towards omniscient ideals, assuming perfect knowledge of both past and future. Such standards are obviously unrealistic but they serve the useful function of distinguishing between appropriate procedures and those that are merely expedient. For example, in order to calculate profits it is useful to know the exact life-time of a machine, a fact seldom known in advance. While the omniscient theorist is content to merely assume a value, the practitioner must make concessions to reality. In practice life-times can always be estimated and revised at a later date when more accurate data become available.

Why Profits

Alice in *Through the Looking Glass* was instructed to think about where she wanted to go before choosing a road and we are well-advised to do the same. Any measure of profit begins with its

purpose. For example, is the goal to measure the income of corporations arising from current production or to assess the performance of a particular corporation? Just as there are a variety of valid purposes, there are also a variety of valid measures. The next section outlines some of the possibilities.

One of the important functions of the *national income product accounts* (NIPA) is to assign every dollar of current output to some sector in the form of income. For the corporate sector, its income, or profits, constitute its share of current output. In this case it would be a mistake to include capital gains because the appreciation of any asset--such as land, raw materials, or the stock of another company--are not part of current production. To count capital gains as profits when they are not part of current output would violate the explicit purpose of national income accounting.

There are other measures of profits in which capital gains are included. Corporate *financial statements*, for example, attempt to gauge the performance of companies in terms of the surplus available to pay taxes and dividends and finance future investment. A dollar realized from a capital gain will serve just as well for this purpose as one earned from current production.

A third major purpose for calculating profits is to determine the corporate income tax. The exact rules for calculating taxable profits--as specified by the Internal Revenue Service--are not always the same as those used for national income or financial statements. IRS profits may exclude or include certain revenues or

costs in direct contrast to NIPA and financial statements.[1]   Another important difference is related to timing.   At what point does a sale constitute revenue: when the contract is signed or as the IRS prefers, when payment is made?   Also, the government has at various times allowed businesses to change the way they calculate profits in order to reduce their taxable income and consequently their tax liability.   Such changes were typically made in the interest of reducing corporate taxes rather than improving the accuracy of the profit measure.

In addition to these three primary purposes for measuring profits, various government agencies collect data on profits to monitor the performance of the corporate sector.   The Securities Exchange Commission for example requires regular reports as does the U.S. Department of Commerce which publishes its data in the *Quarterly Financial Report.*   The data collected by both agencies are closely related to corporate financial statements.

Capital Gains

A fundamental question is how to handle capital gains (including capital losses).   Are these to be counted as profits?   A simple answer is to calculate capital gains as a separate category to be included in some definitions (financial statements) and

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[1] The depletion allowance, for example, is a cost allowed by the IRS but not by NIPA. Firms are also more likely to use straight line depreciation in their financial statements than in their tax returns.

excluded from others (NIPA). All other profits are derived from current production and can be defined as *current profits*.

But before recording capital gains, it is necessary to decide whether they should be measured by *accrual* or *realization*. Accrual has the theoretical advantage of recording capital gains in the period they occur. It is especially appropriate when securities held by a company or its debt held by others change in value. Capital gains are readily identifiable for these securities even when they aren't sold because of the existence of active markets. For the same reason it is also possible to estimate accrued capital gains arising from land and inventories based on prevailing prices.

Capital gains for plant and equipment are more difficult to ascertain under the accrual method, especially in the absence of active markets for these assets. It must also be remembered that the value of physical capital will change as a result of both physical deterioration and external forces. At the same time that wear and tear erodes the value of older capital, increased product demand may restore some of its value. Thus the market value of any piece of capital, also referred to as its replacement value, represents the net effect of depreciation and capital gain.

Net Interest

Another issue confronting the calculation of profits is whether to include *interest* payments; do these represent costs or profits? Again, it helps to look at the purpose of the measure. Financial statements are intended to provide information to investors about the performance of their company and are therefore justified in

their current practice of treating net interest as a cost. Investors are principally interested in profits because they represent direct gains (dividends) and potential gains (retained earnings). Interest payments reduce these gains and it therefore makes sense to treat them as a cost. Lenders may also prefer a definition of profits limited to dividends and retained earnings because it indicates the ability of the firm to continue making interest payments on debt.

One could easily arrive at the opposite conclusion were the purpose to identify total profit income out of current domestic production. Income generated as interest payments to bondholders bears a striking similarity to dividend income distributed to stockholders. Furthermore, equity and debt represent competing sources of capital where dividends and interest represent the cost of this capital. Differences that do exist between the two with regard to voting rights, tax treatment, and priorities during liquidation, do not vitiate the essential fact that both dividends and interest constitute a return to capital. Although current practice does not count net interest as profits in national income accounts, one could make a strong case for doing so.

Double Counting

While most economists are familiar with the precautions taken to prevent double counting gross domestic product, they may be less familiar with the steps taken to prevent double counting profits. The problem arises because firms report dividends they

receive from other firms as revenue.[2]   This is appropriate for financial statements reporting profits of a single firm but when profits are added together for many firms it results in double counting.   In this case profits are counted once as dividends paid out by one firm and again as revenue received by another.   For any aggregation of company profits it is essential to subtract the value of dividends received from other corporations.   The problem of double counting can be especially serious when the profits of financial and nonfinancial profits are added together.   Only NIPA corrects for this in calculating aggregate profits.[3]

A similar procedure would have to be followed if interest were classified as profits in national income.   Interest payments received from other firms would have to be subtracted from revenue. Again this would be especially important when combining the profits of financial and nonfinancial firms because the former receive sizeable interest payments from the latter.   While this deletion would tend to decrease profits, especially in the financial sector, designating interest paid out as profits would tend to increase them.

Capital Costs

Profits are easier to calculate when revenue and costs are both incurred in a single period.   But this is seldom the case. Revenue in any year is typically derived from plant and equipment

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[2] For tax purposes, dividend income qualifies for generous deductions. See IRS Publication 542, "Tax Information on Corporations", 1992, page 4.
[3] Neither QFR nor *Business Week* corrects for this nor does Compustat in its industry reports.

purchased many years earlier. The problem is to allocate the cost of this capital expenditure to current production. An accurate allocation of these costs, defined as depreciation, is essential in order to have an accurate measure of current profits.

The depreciation rate should indicate the fraction of capital that is exhausted for the purpose of current production. Before reviewing the practical alternatives it is useful to ask, what the most appropriate method would be? Conventional thinking about depreciation typically focuses on life-time output. A light bulb is a familiar example of something that can generate constant output throughout its life-time. The ratio of its annual hours to its total life-time hours is a practical measure of its depreciation rate. If annual operating hours are constant, this rate is equivalent to the inverse of its life-time, the same ratio used in straight line depreciation.

For other types of capital, productivity will gradually deteriorate, such as nuclear power plants which suffer increasing outages with age. It is justified in such a situation to use a higher depreciation rate in its earlier years when annual production is at its peak. The omniscient observer merely divides the annual output of such capital by its total life-time output to derive an appropriate depreciation rate.[4] The practitioner is left with the task of

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[4] Another way to estimate depreciation is based on replacement value in the original year of purchase. The difference between the purchase price of a machine at time 0 to its replacement value again in time 0 but after one year of operation, indicates the appropriate amount of depreciation. The advantage of this method is that it excludes any revaluation due to capital gains. But the hypothetical nature of this method may make it even less practical than the production concept described above.

determining current output from a particular piece of capital as well as its total life-time output.

Once the rate is determined, it is multiplied by the value of capital remaining at the beginning of the period. But values of remaining capital should always be inflated to current prices so that different dollars are not used when depreciation is subtracted from current revenue.

This raises the next question, should capital values be appreciated at the general inflation rate or the inflation rate of the particular asset? The first is referred to as constant dollar value and the second as replacement cost. Which method is used will, to some extent, determine the distribution between depreciation and current profits.

The constant dollar method has the advantage of being based on what was actually paid for the capital stock. When firms pay less for capital, for whatever reason, they also have lower constant dollar depreciation charges and therefore higher current profits. This approach corresponds with the view that profits are derived from distinct but overlapping cycles. The production cycle begins when the first capital costs are incurred and ends in the year that revenue is generated. Whether the firm ever produces again has no bearing on the profits generated from a particular cycle. This method probably corresponds most closely to the common understanding of profits for an individual firm and may therefore be most appropriate for financial statements.

Depreciation based on replacement cost, on the other hand, is based on prevailing prices, entirely independent of original

expenditures. As far as current profits are concerned, it makes no difference whether a firm paid a little or a lot for its capital. The value of depreciation and therefore current profits are not affected by how much the capital originally cost.

Under the replacement method, depreciation corresponds with the estimated expense of maintaining the real value of the capital stock. Consequently it is sometimes referred to as the *capital maintenance* method. Rather than representing the surplus generated from particular cycles, the replacement method treats the firm as a going concern, exiting each profit period with its real capital stock restored.

This view of the firm may be more appropriate for national income accounting for three reasons. First, because it combines many firms over long periods of time, the going concern concept is more appropriate. Second, the difference between gross investment and depreciation based on replacement cost represents the real addition to capital stock, a useful concept defined as net investment. And third, a single general price index for capital stock can be used to adjust depreciation for all firms.

While replacement cost applies well to national income and constant dollar to financial statements, this is not an immutable rule. Either approach could, in all practicality, be used for either purpose. The choice will be of little practical consequence when the general inflation rate and asset inflation rate are identical or nearly so. But the method ultimately adopted will determine whether profits are based on a capital maintenance or production cycle framework.

The capital stock, like any asset or liability, can also experience capital gains. While these gains may be irrelevant for national income accounts, they may be important for individual firms. A real gain occurs when the inflation rate of an asset differs from the general inflation rate. The difference between these two rates, applied to the remaining value of capital, determines the amount of capital gain experienced in a given year. Only when values appreciate at the general inflation rate, is there no capital gain. Appendix A provides an example of how to calculate real accrued capital gains and depreciation.

Inventories

Like the capital stock, some materials are not purchased in the same year that they are used in production. Fortunately the methods used to value capital can also be applied to materials. Both entail assigning costs incurred in one period to production in a later period and since materials are often comprised of discrete physical units, they may be even easier to assign to current production.

But the same question arises, how should these units be valued? Should they be based on the purchase price, corrected for inflation, as in the constant dollar method? Or should they be based on prevailing material prices, in other words, replacement cost. The choice, as in the case of capital stock, depends on whether one adopts a view of production cycles where original purchase price is important or capital maintenance predicated on constant real inventory. Once again there is no correct answer although the former may be preferable for financial statements and the latter for

national income. Whichever method is adopted for capital, however, should, for the sake of consistency, be used to value material inputs.

Neither method exactly corresponds with the two most widely used accounting methods, last-in first-out (LIFO) or first-in first-out (FIFO).[5] LIFO and replacement costs are equivalent only when the physical stock in inventory does not diminish. Otherwise LIFO will value those units drawn out of inventory at their original purchase price, which may differ widely from replacement value. FIFO on the other hand, does not accurately value inputs in current prices. An alternative measure has been suggested, constant dollar FIFO, which corresponds to the constant dollar method. Each method is described in more detail in Appendix B.

Inventories can also experience real capital gains when the rate of inflation for such goods exceeds the general inflation rate. The method of calculating real accrued capital gains from inventories is identical to that used for capital stock.[6]

Other Assets and Liabilities

Capital gains also arise from changes in the real value of land, financial assets and financial liabilities. For example, stocks in other corporations that appreciate faster and debts that appreciate slower than inflation constitute real capital gains. The opposite

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[5] There is a third option, "lower of cost or market" which has its own idiosyncrasies. The results of this method increase the cost of goods sold when market prices fall below original acquisition cost. The effect is to reduce profits by the amount of the nominal value of the inventory loss. See Likolai, Loren et. al. Intermediate Accounting, Third Edition. Boston: Kent Publishing, 1985, p. 402.

[6] By this definition, real capital gains apply to changes in the replacement value of inventories existing at the beginning of the profit period.

occurs when real values of financial assets fall and debts rise. On an accrual method, each gain or loss should be recorded at the time of occurrence.

It is possible that a firm will never realize the gain from a decrease in the value of its debt. Furthermore, as bonds approach maturity, their values are destined to return to face value. There is a question then of whether accrual is an appropriate way to record capital gains of such financial instruments. But if the objective is to record capital gains in the period that they occur then there is no alternative.

Time Value of Money

Even in the absence of inflation, economists have a deep appreciation for the fact that dollars do not have the same value in different time periods. Therefore an enterprise that generates a dollar today from fifty cents invested last year is clearly more profitable than one that produced the same revenue from fifty cents invested two years ago. The calculations described up to this point correct for inflation but not for the time value of money.

There are at least two alternatives available to deal with this issue: one uses a discount rate and the other uses the internal rate of return. The discount rate is used much like the general inflation rate to insure that all dollars are converted to current values. Costs incurred in the past for capital stock and inventories are simply appreciated to higher current values.

The difficulty with this method is determining an appropriate discount rate. The typical approach is to choose a familiar real

interest rate, on U.S. Treasury bonds for example. But the result would not be particularly useful to most economists because profits would then become a direct function of interest rates. High interest rates would tend to depress profits by increasing the discount rate.

An alternative uses the internal rate of return and avoids the problem of having to choose an arbitrary discount rate. The first step calculates an internal rate of return based on costs from each period and revenue in the current period. In the second step, total profits are calculated for a comparable firm or group of firms with the same current revenue and rate of return. The comparable firm is unique however in that all of its costs are incurred in the current period. These steps are described mathematically in Appendix C.

There is always the alternative of not correcting for the time value of money, making the implicit assumption that the discount rate is zero. This assumption is more appropriate for some purposes such as NIPA which values capital consumption on a replacement basis. It doesn't matter whether $100 of capital replacement is charged to equipment that is one or fifty years old as long as the capital stock is maintained.

However, when profits are calculated as the outcome of a cycle of production, it is more appropriate to consider the time value of money. Because actual capital costs matter in this calculation, the timing of the costs should also matter. Financial statements do not currently account for time.

What would be the effect of taking into account the time value of money? It is possible to illustrate what the approximate effect would be by using data currently available from the IRS. Although

these data have flaws, some of which will be discussed in the next section, they are useful for illustrative purposes.

The IRS estimates total receipts or revenue, net income, depreciation charges, depreciable assets, and accumulated depreciation for all corporations. From this information it is possible to calculate remaining depreciable assets[7] and the average age of capital.[8] Using the method described in Appendix C, the internal rate of return in 1988 was found to be 3.72 percent. Based on this result, total profits would be approximately 22 percent lower than actual net income reported for tax purposes. If the time value of money were taken into account, it is conceivable that reported profits would decline by approximately one-fifth.

National Income Product Accounts

The purpose of NIPA is to measure profits out of current production. It does not, therefore, recognize capital gains as profits, a matter that greatly simplifies the calculation. In addition, because NIPA is based on replacement cost, there is no need to take into account the time value of money.

NIPA begins with data from the Internal Revenue Service and the Quarterly Financial Report and then makes a number of appropriate adjustments.[9] Included among these are corrections for

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[7] That is, depreciable assets less accumulated depreciation.

[8] In other words, remaining depreciable assets divided by annual depreciation charge.

[9] A detailed explanation can be found in "Corporate Profits: Profits Before Tax, Profits Tax Liability, and Dividends," U.S. Department of Commerce, Bureau of Economic Analysis, May 1985.

dividends received from other U.S. corporations (avoids double counting), capital consumption (straight line at replacement cost with consistent life-times) and inventory valuations (replacement cost). Although straight line depreciation may not be appropriate for all classes of capital stock, the IRS convention clearly allows too much individual latitude. Firms choose straight line or one of several versions of accelerated depreciation, often with the goal of minimizing tax liabilities. Straight line depreciation may not be a perfect measure of actual depreciation for all capital stock but it is probably superior to allowing individual discretion motivated by tax minimization.

Where NIPA can be faulted is that it designates net interest as a separate category rather than a component of corporate profits. In order to correct for this, interest paid by the corporate sector should be added to profits and to avoid double counting, interest received by the corporate sector from other corporations should be subtracted. The U.S. Department of Commerce reports the former, interest *paid* by the corporate sector, but does not identify the source of interest received by the corporate sector. A reasonable approximation is to adjust profits for net interest by assuming that all interest received by corporations originates in the corporate sector.[10]

The effect of including net interest in corporate profits of nonfinancial corporations is illustrated in Figure 1 for the years

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[10] This assumption will cause the profit share to be underestimated since interest received from the corporate sector is overestimated. The bias for nonfinancial corporations alone is probably not large but for all corporations, including financial, it could be significant.

1929 to 1991. The first point is that this adjustment has little effect on short-run profit cycles which continue to rise during expansions and fall during recessions. The most important impact is on the long-run trend. Unadjusted profits display a long-run decline beginning in the early 1940s and accelerating after 1965. Once profits are adjusted for net interest, the pattern changes. While profit shares remain higher in the early period, 1946 to 1969, the decline after 1970 appears to be characterized by a single shift rather than a steady deterioration.[11] In fact, since 1970, adjusted profit shares reveal no clear long-run trend.

[Figure 1 here]

What is most remarkable about this finding is the relative constancy of profit shares during a period of profound economic disturbances including two recessions, two oil crises, a significant decline in union density, record trade deficits, interest rates, and budget deficits. Despite these developments adjusted profits of nonfinancial corporations never strayed far from its average for the past twenty-one years, approximately 7.9 percent of gross domestic product.

Internal Revenue Service

The IRS measure of profits, total receipts less total deductions, is useful but not always consistent. It's primary value is that it provides a wealth of information and is used as the raw

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[11] The average profit share adjusted for net interest was 9.8 percent from 1946 to 1969 compared to 7.9 percent from 1970 to 1991.

data for NIPA statistics. It is inadequate from an economic perspective, however, because it does not actually represent real accrued profits. One way to better understand these issues is to examine the preliminary adjustments made to IRS profits in order to convert it to a national income measure.

Remember that NIPA, unlike the IRS, is exclusively concerned with profits from current production. Therefore NIPA subtracts net capital gains from IRS profits, specifically those realized from the sale of property. In 1989, this constituted the single largest adjustment, reducing IRS profits by 21 percent. The second largest adjustment was for bad debts. NIPA is not as generous as the IRS in allowing firms to deduct reserves for bad debts and when corporations default on debt, NIPA counts it as income. These debt adjustments increased IRS profits by approximately 18 percent. NIPA also subtracts dividends received from other corporations to avoid double counting, amounting to a reduction of 6.4 percent in 1989.[12]

Other adjustments are required to account for the profits of institutions omitted from IRS Corporate Returns, and for expenses that may or may not be considered legitimate for national income purposes. Another set of adjustments are made to separate domestic and rest-of-the-world profits. In 1989, the cumulative effect of all these preliminary adjustments resulted in a 12% reduction from IRS profits.[13]

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[12] Table 8.22, *Survey of Current Business*, July 1992, page 113.
[13] Ibid.

Following these preliminary adjustments, NIPA makes two final adjustments. The first one corrects for inconsistencies in valuing inventories for determining cost of goods sold. For tax purposes, corporations generally choose between FIFO and LIFO. Therefore NIPA includes an inventory valuation adjustment in an attempt to convert the data to a replacement cost basis. Figure 2 shows the impact of inventory valuation adjustments from 1960 to 1991. Adjustments in recent years have been relatively small compared to the high inflation years of the 1970s in which tax returns based on FIFO greatly exaggerated corporate profits.

[Figure 2 here]

The second adjustment is required by the fact that depreciation methods vary over time, vary across businesses, and are based on historical costs uncorrected for inflation. Correction for inconsistent accounting methods in 1991, amounted to an increase of 26.1 percent relative to NIPA's adjusted measure of corporate profits. But adjustments for current replacement costs represented a reduction of 23.7 percent. The combination of both corrections amounted to a net increase of only 2.4 percent of adjusted profits. In this year at least, the two corrections for depreciation largely offset one another. In earlier years the correction was relatively more important as illustrated in Figure 2. IRS methods of calculating depreciation overstated profits from 1975 to 1982 because they failed to account for inflation but understated them in almost all other years because of inappropriate accounting practices.

Financial Statements

As a general rule, financial statements do not measure profits in the same way as NIPA, nor should they. Financial statements include capital gains and NIPA does not. This raises the question of how capital gains are currently measured and how they should be measured. The current practice is to ignore inflation and measure capital gains on realization as opposed to accrual. Counting these gains only when realized is a practical solution to a difficult measurement problem, but it does not come close to measuring actual capital gains when they occur. The problem is that two companies with identical accrued capital gains could have very different realized gains simply because one decided to sell an asset and the other didn't.

Not all capital gains are difficult to measure on an accrual basis. Take inventories for example. One first calculates the difference between the general inflation rate and that on inventory goods. The product of this difference and the original inventory is equal to the real accrued capital gain. One could also approximate this gain by the difference between LIFO costs and constant dollar FIFO costs. Under certain conditions, described in Appendix B, this difference will exactly equal real capital gains on inventory.

In their work, Shoven and Bulow (1975) reported the results of converting costs under LIFO to costs under constant dollar FIFO. Either method is appropriate for calculating current profits, although the former is based on capital maintenance and the latter

on production cycles. But the difference between the two measures is also a good approximation of real inventory capital gains.

In 1974, real capital gains from inventory were highest for American Can company, representing 52% of before-tax profits in that year. Standard oil of California also experienced large unreported gains of approximately 41% of before-tax profits. Capital losses were experienced by some companies, such as Westinghouse, United Technologies, and International Paper. For all 19 companies for which data were available, real inventory capital gains averaged 5% of before-tax profits in 1974. Inflation was of course particularly high that year, perhaps making it less comparable to other years.

Cagan and Lipsey (1978) estimated the combined capital gains for all reproducible capital for nonfinancial corporations from 1955 to 1977. These included structures, equipment and inventories. Their estimates of these gains ranged from 38 percent of before-tax profits (national income basis) in 1973 to low of -26 percent in 1961. A separate comparison of capital gains on land ranged from a low of 4 percent in 1966 to 12 percent in 1973. Each of these capital gains are significant because they represent accrued gains that are not normally reported in company profits.[14]

Capital gains also occur when the market price of corporate debt falls. This gain is currently reported only on realization as when a company buys back its debt. A more precise method is to calculate the gain on an accrual basis, regardless of whether it is

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[14] These are not real gains since they are based on nominal prices.

bought back. The significance of introducing this change was also estimated by Shoven and Bulow (1976). For a sample of 30 firms in 1974, profits before taxes would have increased 15 percent.

Firms experience capital gains when debt values fall and capital losses when debt values rise.[15] The direction of the change is related to changes in interest rates. Estimates of these capital gains for the nonfinancial sector as a whole from 1955 to 1977 reveal gains as high as 35 percent of before-tax profits in 1974 to losses of 31 percent in 1976.

Another capital gain occurs when inflation reduces the value of net financial assets, defined as total financial assets less total financial liabilities. Since most firms have negative net financial assets (greater debt than assets), inflation causes a capital gain. For 1974, a high inflation year, Shoven and Bulow (1976) found a capital gain on net financial assets for thirty large companies averaging 23 percent of before tax profits. The range of impact on individual companies was extreme, raising profits 130 percent at one end and reducing them by 149 percent at the other. The actual impact depended on the level of indebtedness.

Separate estimates of the same phenomena were presented by Cagan and Lipsey for all nonfinancial corporations between 1955 and 1977. The capital gains on net financial assets ranged from 1 to 3

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[15] One could make the case that capital gains and losses from changes in the value of debt are not symmetric. When bond prices fall the firm is better off because it can choose to retire debt at the new low price rather than wait until maturity and pay the face value. If bond prices rise, however, the firm may be no worse off since it can always wait until the bonds mature. Falling bond prices may offer a real gain but rising prices may not constitute a real loss.

percent of before-tax profits in the early 1960s to 23 percent in 1973 and 40 percent in 1974.

Each of these points indicate a failure of financial statements to accurately represent real capital gains on an accrual basis. The estimates presented demonstrate that these unreported capital gains are not insignificant. Over time, however, some gains may tend to cancel out as in the case of debt when interest rates rise and fall. But in general, financial statements and tax statements are particularly deficient in reporting capital gains.

The magnitude of error in representing profits from current production is probably somewhat smaller. In company financial statements this value is generally identified as current operating income. The most important problems arise because financial statements, like tax returns, fail to account for inflation in the value of materials and capital stock. The magnitude of the problem with respect to materials will be essentially the same in financial and tax statements since companies are required to use the same inventory method in both. Therefore the magnitude of error for financial statements is approximately the same as the inventory valuation adjustment derived for IRS data presented in Figure 2.

However, the capital consumption adjustment required for profits derived from financial statements would not be the same as the one required for IRS data. The reason is that firms are allowed different depreciation methods in their financial and tax statements. In general, firms are more likely to use accelerated depreciation in their tax statements because it tends to reduce their tax liability. The wider use of straight line depreciation in financial

statements implies that the capital consumption adjustment for profits based on financial statements would generally be smaller than the one pictured in Figure 2 for IRS data.[16]

Other Data Sources

The Department of Commerce offers another source of profit data through its Quarterly Financial Report (QFR). This survey provides estimates of profits for corporations in manufacturing, mining, retail and wholesale trade. The sample is comprised of all large corporations (assets greater than $50 million) filing corporate tax returns and a rotating sample of smaller firms.[17] One desirable feature of this survey is that it reports quarterly data, thus providing a resource for NIPA in producing its own quarterly figures.

The data in QFR are likely to correspond more closely to financial statements than tax returns. This means, for example, that QFR accounts are more likely to utilize straight line than accelerated methods of depreciation.[18]

Financial data, including profits, compiled by Compustat are also based on company financial statements. Company reports provide the first source of financial data for Compustat which are then supplemented with additional data from 10K Reports filed with

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[16] The positive component required to convert depreciation to consistent accounting at historical cost would be smaller while the negative component required to convert to current replacement cost would remain largely unchanged.

[17] *Quarterly Financial Report*, Second Quarter, 1992, U.S. Department of Commerce, page XI.

[18] *Quarterly Financial Report*, Second Quarter, 1992, U.S. Department of Commerce, page XIII.

the Securities Exchange Commission (SEC).[19] Compustat data, in turn, is the source for profit data reported by *Business Week* for its quarterly report on 900 large U.S. corporations. Since both QFR and SEC reports are based on financial statements, they will share many of the same limitations discussed earlier. In addition, when profit data are aggregated, both will double count profits that are distributed to other corporations as dividends.

Comparisons

A comparison of annual profit shares for NIPA, QFR, and *Business Week* are presented in Figure 3.[20] Perhaps the first impression to be drawn from this comparison is that despite accounting differences, all three measures appear to move together during most short-run cycles. The second lesson is that the first impression is not always right. In 1974, 1975, and 1979, NIPA profits moved in the opposite direction as the other two. Evidently the high inflation rates associated with the energy crises of the 1970s caused the two series that were not adjusted for inflation, *QFR and Business Week*, to give misleading indications of profits. But for most other periods, the profit pattern is generally similar.

[**Figure 3 here**]

A comparison of quarterly data is presented in Figure 4. In this case, NIPA only reports seasonally adjusted data which

[19] The source of this information was Jim Brooks at Compustat.
[20] *Business Week's* sample included approximately 900 firms covering a wide variety of industries except between 1973 and 1984 when the sample was expanded to 1200 firms.

eliminates much of the quarterly variation. Given this fact, all three measures appear to follow the same general pattern, although the level of correspondence is noticeably weaker for quarterly than for annual data.

[**Figure 4 here**]

Conclusion

While there is no such thing as the best measure of profits, there are certain measures which do a better job of meeting their stated purposes. NIPA profits, especially when adjusted for net interest, provide a reasonable estimate of nonfinancial corporate profits from current production. But until the source of interest received is properly identified, it will be difficult to combine nonfinancial and financial profits to get a meaningful estimate of total corporate profits.

Financial statements are probably most useful as a way to estimate profits from current production for individual firms. But even here, several corrections should be made to operating income, analogous to those made for national income. Depletion allowances or reserves for bad debts, for example, could be eliminated when they are not based on actual costs. Also, corrections for inventory and capital consumption become increasingly important during periods of high inflation. While constant dollar calculations, based on the GNP deflator for example, may be preferred, even replacement cost estimates would be an improvement over current practices.

Currently available profit measures probably do the worst job of indicating corporate capital gains. Realized capital gains may be

useful for tax purposes but fail to indicate changes in the overall welfare of the corporate sector from real changes in assets and liabilities. Studies that have attempted to estimate real accrued capital gains indicate that these values are relatively large, even exceeding profits from current production for some corporations in some years.

Finally, economists may feel uncomfortable using profit data that has not accounted for the time value of money. The method suggested in Appendix C takes this into account without imposing an arbitrary discount rate. A cursory application to tax data found an internal rate of return of 3.72 percent on depreciable assets which tended to reduce profits by approximately 20 percent.

Finally, there should be some consolation in the fact that even different profit measures appear to follow the same annual, and to a lesser extent, quarterly pattern. While profit levels may be debatable, changes in profits from one year to the next, are, except for extraordinary circumstances, largely consistent from one profit measure to the next.

Appendix A
Profits from Current Production and Capital Gains
Replacement Value Concept

It is possible to specify profits originating from current production and capital gains in mathematical terms. In this section, current profits are based on replacement value while capital gains are based on real accrued asset values. The first part describes the calculation with regard to capital stock and the second with regard to inventories.

Capital Stock

We begin by defining d as the depreciation rate, the fraction of the original capital that is expended for current production. The cost is then determined by the value of capital in last year prices (V_{t-1}) and the inflation rate for that asset (I_A) during the profit period. The depreciation cost is then equal to,

(1) $V_{t-1} (1+I_A)d$

If we were to use the constant dollar method we would simply replace the asset inflation rate (I_A) with the general inflation rate (I).

The capital gain is determined by the increase in real value from the previous period.

(2) $V_{t-1} (I_A-I)(1-d)$

The capital gain only applies to the remaining capital, hence the term $1-d$.[21]

Finally, the value of capital remaining at the end of the profit period is calculated as $V_t = V_{t-1} (1+I_A)(1-d)$. This value is then used in profit calculations for the following year.

Inventories

A replacement cost method for valuing inventories can be specified using the same approach. In this case it is useful to distinguish between the quantity of a particular inventory item that is purchased during the period (M_t) and the amount which is used (U_t).

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[21] One could be even more precise since even the capital depreciated during the period can experience a capital gain up to the time it is extinguished. A better approximation would be to use, $1-d/2$.

In contrast to these two flow values, there is also the physical stock of inventory existing at any period in time which is designated as Q_t. During the profit period, physical inventory will either increase, if purchases exceed use, or decrease if use exceeds purchases. The percentage change in the physical quantity of a single homogeneous inventory is analogous to the depreciation rate of capital. Consequently we define d for inventories as,

$$(3) \quad d = \frac{U_t - M_t}{Q_{t-1}}$$

Furthermore, the value of inventories at the beginning of the profit period (V_{t-1}) is equal to the product of the original price and stock $(P_{t-1}Q_{t-1})$.

The cost of goods sold can be calculated by subtracting the value of inputs purchased at current prices (M_t) and adjusting for changes in inventories. The total replacement cost of goods sold is equal to,

$$(4) \quad M_t P_t + V_{t-1}(1 + I_A)d$$

As long as inventories remain constant $(d=0)$, the replacement cost of goods sold is simply the current acquisition cost $(M_t P_t)$. If inventories increase then the second term in (4) subtracts the value of goods added to inventories. If inventories are drawn down a percentage d during the period, then the replacement cost of goods sold out of inventories is calculated in the second term in (4). Notice how this calculation mirrors the calculation for capital depreciation in (1).

The capital gain for inventory is defined as the change in its real value during the period. It is specified exactly the same as (2) for capital stock. The only difference is that d represents the percentage change in the inventory over the period rather than the depreciation rate.

The profits of the firm out of current production are calculated by applying (1) to every capital good and (4) to every inventory good. Capital gains are derived by applying (2) to every capital and inventory good.

Appendix B
Comparison of LIFO, FIFO, and Real Dollar FIFO

This appendix describes the accounting methods, LIFO, FIFO, and constant dollar FIFO in more detail. Specific results demonstrate that total cost for each method is related to current material cost and inventory changes. This fact is particularly useful to convert profits calculated under one method to another and underlies the calculations made by Shoven and Bulow (1975). It should be emphasized that these costs apply to profits from current production and do not include capital gains. Finally, it is demonstrated that the difference between LIFO costs and constant dollar FIFO are related to real capital gains from inventory.

We begin with the following definitions.

C = total material cost
Q_t = inventory quantity at time t
P_t = material price at time t
M_t = materials purchased between t-1 and t
U_t = materials used between t-1 and t
I_A = inflation rate of materials
I = general inflation rate

The stock of materials available for production is equal to the sum of purchases and the original inventory or, $M_t + Q_{t-1}$.

$$|---------------|--------------------|$$
$$\quad Q_{t-1} \qquad\qquad\qquad M_t$$
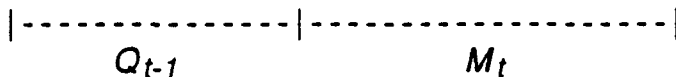
FIFO accounting takes from the left and leaves the right, while LIFO takes from the right and leaves the left. In either case, the amount remaining is Q_t and the total amount used is U_t or $(Q_{t-1}+M_t-Q_t)$.

LIFO

As long as inventories don't decrease over the profit period, LIFO profits will correspond with current profits from the replacement method. However, if inventories are reduced then LIFO profits will include capital gains, but only for those particular units drawn from inventory. This particular gain is based on nominal purchase prices from some earlier period and does not accurately reflect real accrued capital gains.

Consequently, LIFO costs will depend on whether the firm uses more or less of current material purchases. If the firm uses more, then costs are equal to current material costs ($P_t M_t$) plus the additional materials used from inventory (Q_t-Q_{t-1}).

(5) $C = P_t M_t - P_{t-1}(Q_t - Q_{t-1})$
        = current material costs - change in LIFO inventory

If, however, the firm uses less than the amount purchased, then LIFO costs are simply equal to the value of materials used.

(6) $C = P_t U_t$
        $= P_t(Q_{t-1} + M_t - Q_t)$
        $= P_t M_t - P_t(Q_t - Q_{t-1})$
        = current material costs - change in LIFO inventory

Once again, LIFO costs are equal to current material costs less changes in LIFO inventories.

FIFO

FIFO accounting is more compatible with the concept of profit cycles. It is based on the idea that firms purchase inputs in one period with the purpose of producing sales and profits in a later one. The weakness of FIFO is that it does not correct for inflation. Compared to the constant dollar method, it will tend to overstate current profits by using low nominal values for material costs.

The cost associated with FIFO depends on whether more or less of the original inventory is used. If more is used, FIFO costs are equal to the original inventory ($P_{t-1} Q_{t-1}$) and the value of current materials used, $P_t(U_t - Q_{t-1})$.

(7) $C = P_{t-1}Q_{t-1} + P_t(U_t - Q_{t-1})$
        $= P_{t-1}Q_{t-1} + P_t(Q_{t-1} + M_t - Q_t - Q_{t-1})$
        $= P_{t-1}Q_{t-1} + P_t(M_t - Q_t)$
        $= P_t M_t - (P_t Q_t - P_{t-1}Q_{t-1})$
        = current material costs - change in FIFO inventory

If less than Q_{t-1} are used, then FIFO costs are based on the value of inventories actually used.

(8) $C = P_{t-1}U_t$
        $= P_t M_t - (P_t M_t - P_{t-1}U_t)$
        = current material costs - change in FIFO inventory

In both cases, FIFO costs are equal to current material costs less change in FIFO inventory.

Constant Dollar FIFO

This method retains the FIFO structure but inflates the original historical cost at the general inflation rate. It is the appropriate method for calculating current profits based on the constant dollar approach.

Like FIFO, the cost of constant dollar FIFO depends on whether more or less of the original inventory is used. If more than the original inventory is used, constant dollar FIFO costs are again equal to the original inventory and the value of current materials used, except this time the value of the original inventory is increased for inflation at the rate $(1+I)$

$$
(9) \quad \begin{aligned}
C &= (1+I)P_{t-1}Q_{t-1} + P_t(M_t-Q_t) \\
&= P_tM_t - [P_tQ_t - (1+I)P_{t-1}Q_{t-1}] \\
&= P_tM_t - [P_tQ_t - P_{t-1}Q_{t-1} - IP_{t-1}Q_{t-1}]
\end{aligned}
$$
= current material costs - change in FIFO inventory
   - inflation of original inventory

If less than the original inventory is used, then constant dollar FIFO costs are again based on the value of inventories actually used .

$$
(10) \quad \begin{aligned}
C &= (1+I)P_{t-1}U_t \\
&= P_tM_t - [P_tM_t - (1+I)P_{t-1}U_t] \\
&= P_tM_t - [P_tM_t - P_{t-1}U_t - IP_{t-1}U_t]
\end{aligned}
$$
= current material costs - change in FIFO inventory
   - inflation on that part of the original inventory used

The conclusion of this exercise is quite simple. To convert costs between LIFO and FIFO one simply adds the inventory change for the original method and subtracts the inventory change for the second. The same is true for constant dollar FIFO with the addition of an inflation term. If one assumes that the entire original inventory is used during a period, as Shoven and Bulow (1975, page 571) do, then this adjustment is simply equal to the inflation rate multiplied by the value of the original inventory as in (9).

Finally, if firms use more than the original inventory but less than the amount purchased, it is possible to show that the difference between costs under LIFO and constant dollar FIFO is

equal to real capital gains on inventory. We start with equations (5) and (9).

(11) C(LIFO) - C(Constant Dollar FIFO)

$$= P_t M_t - P_t(Q_t - Q_{t-1}) - [P_t M_t - P_t Q_t + (1+I)P_{t-1}Q_{t-1}]$$

$$= - P_t Q_t + P_t Q_{t-1} + P_t Q_t - (1+I)P_{t-1}Q_{t-1}$$

$$= P_t Q_{t-1} - (1+I)P_{t-1}Q_{t-1}]$$

$$= (1+I_A)P_{t-1}Q_{t-1} - (1+I)P_{t-1}Q_{t-1}]$$

$$= (I_A - I)P_{t-1}Q_{t-1}$$

$$= \text{real inventory capital gain}$$

Therefore, one can approximate real capital gains on inventory by the difference between costs calculated using LIFO and constant dollar FIFO.

Appendix C
The Time Value of Money

This section outlines one possibility for including the time value of money based on an internal rate of return. It is assumed that revenue (R_t) is associated with the present period as are some costs (C_t). Other costs are incurred in the past, as far back as T years (C_{t-T}). The first step requires us to solve for the internal rate of return (r) in the following equation.

$$(12) \quad R_t - C_t(1+r) - C_{t-1}(1+r)^2 - \ldots - C_{t-T}(1+r)^{T+1} = 0$$

We calculate profits (π) in the second step for a hypothetical firm with the same rate of return and revenue but whose costs (C_0') are entirely incurred in the current period.

$$(13) \quad R_t - C_t' = \pi_t \qquad\qquad R_t - C_t'(1+r) = 0$$

$$\frac{R_t}{1+r} = C_t'$$

$$R_t - \left(\frac{R_t}{1+r}\right) = \pi_t$$

$$R_t\left(1 - \frac{1}{1+r}\right) = \pi_t$$

Simplifying this we find,

$$(14) \quad R_t\left(\frac{r}{1+r}\right) = \pi$$

According to this final result, current revenue must be multiplied by the ratio, $r/(1+r)$, to determine total profits.

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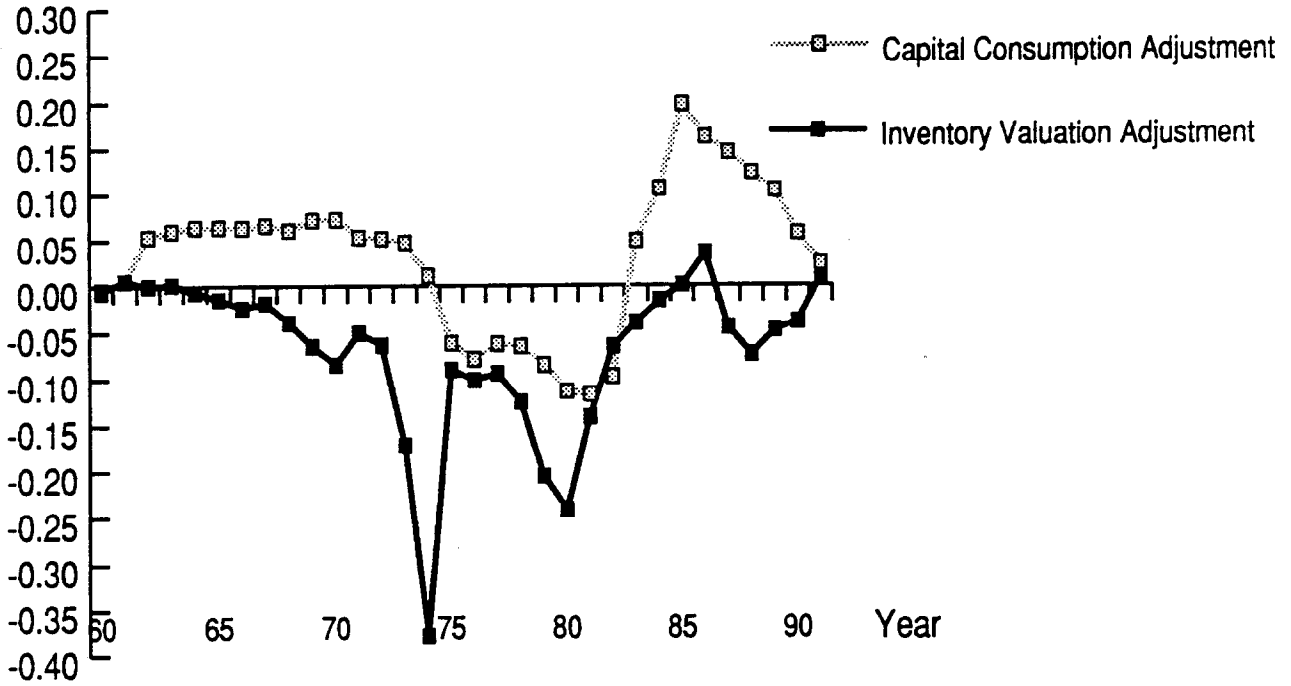
Figure 1
Profit Shares Adjusted for Net Interest
Nonfinancial Corporations, 1929-1991

Profit Share

.... (Profits + Interest)/GDP

▬■▬ Profits/GDP

Year
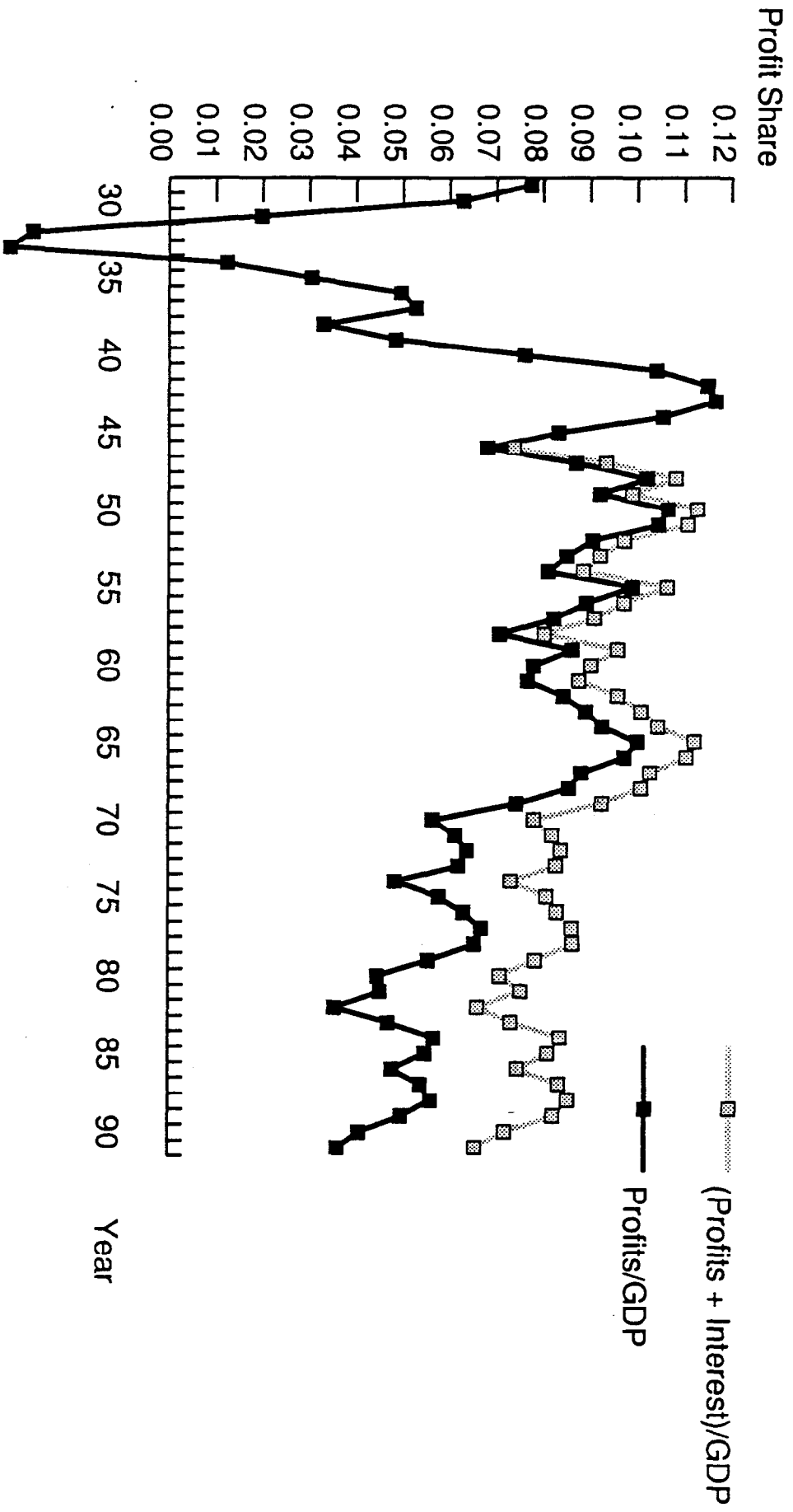
Source: The National Income and Product Accounts of the United States, 1929-92,
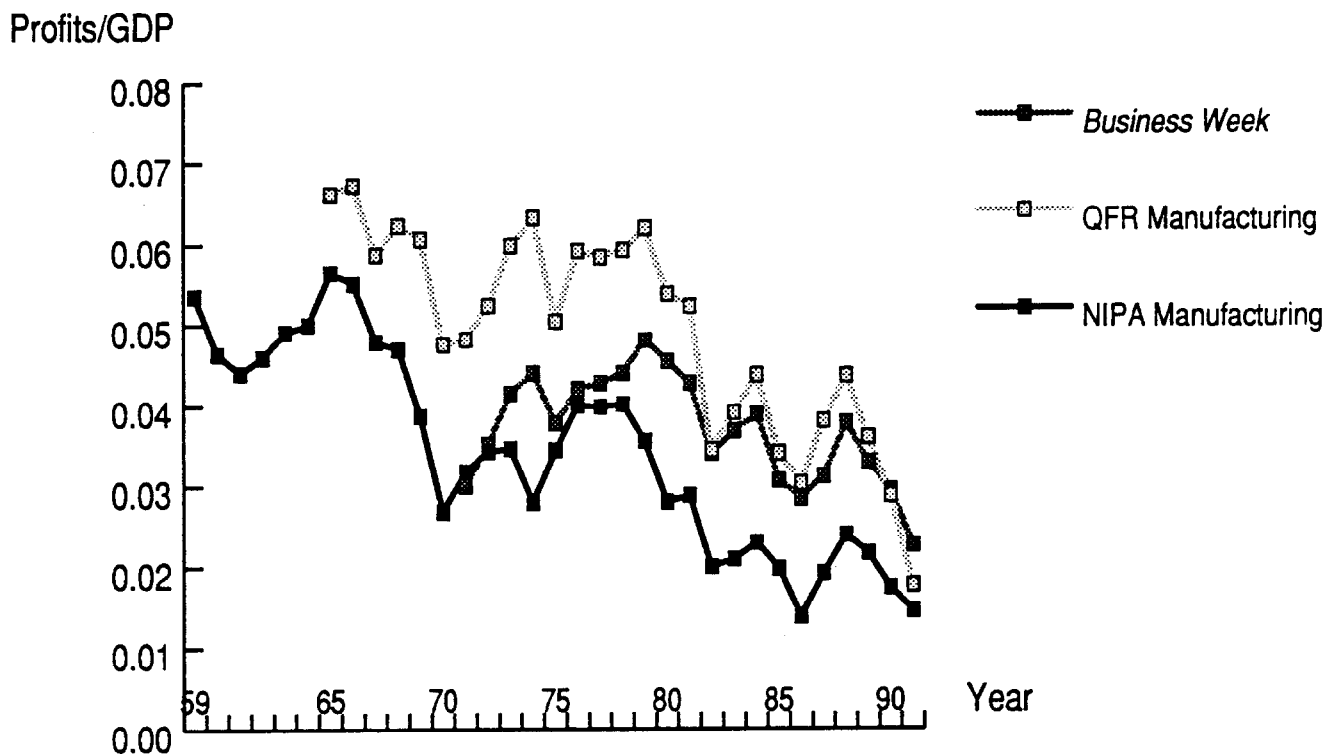and Business Statistics, 1963-91.

Figure 2
NIPA Adjustments Relative to Total Corporate Profits
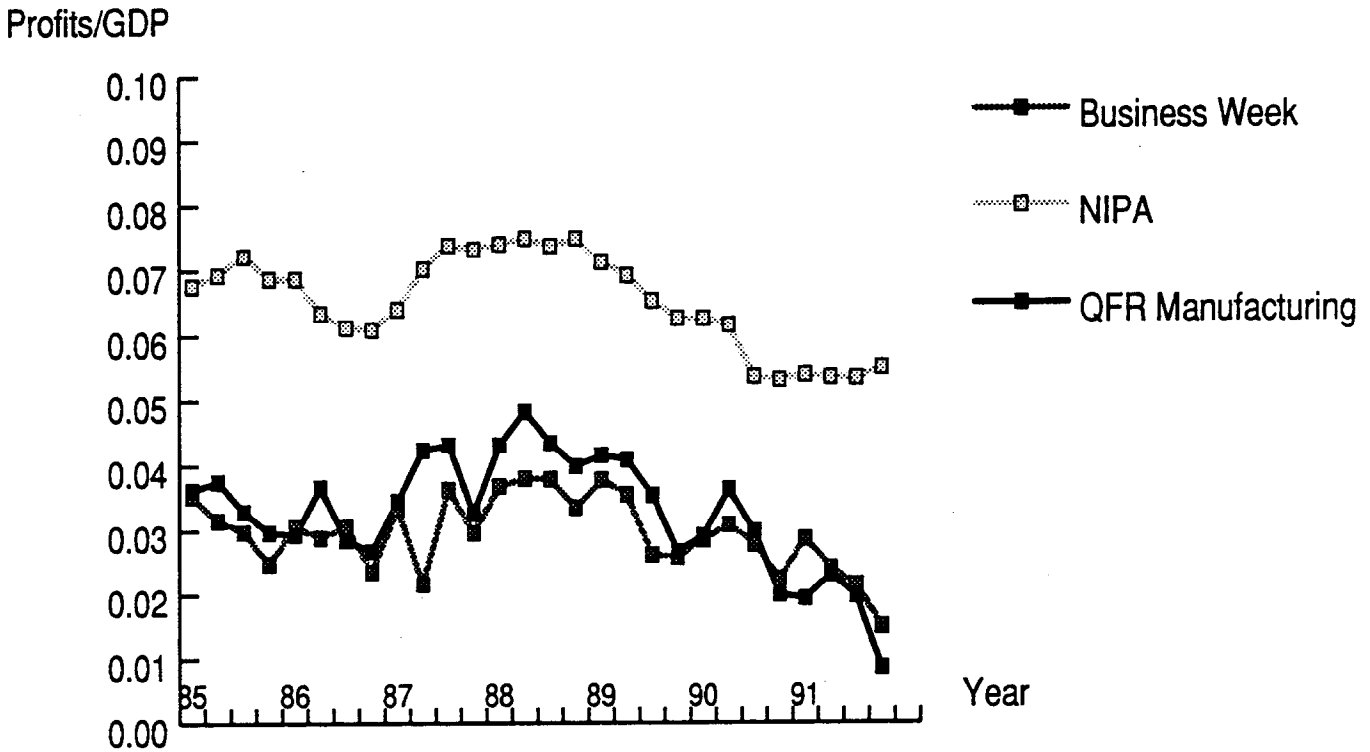1960-1991

Adjustments/Profits

Source: *Business Statistics, 1963-91*, U.S. Department of Commerce.

Figure 3
Comparison of Manufacturing Profits
NIPA, QFR, and *Business Week*, 1959-1991

Sources: *Quarterly Financial Report*, Second Quarter, 1992, U.S. Department
of Commerce. *Economic Report of the President*, Feb. 1992, and
various issues of *Business Week*, 3/11/72 through 3/16/92.

Figure 4
Profit Shares Relative to GDP
Quarterly Data, 1985-1991

Profits/GDP

Sources: *Quarterly Financial Report*, Second Quarter, 1992, U.S. Department
of Commerce. *Economic Report of the President*, Feb. 1992, and
various issues of *Business Week*, 3/11/72 through 3/16/92.