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CHAPTER 1

PRINCIPLES AND METHODS

§ 1a. Basis of Estimates

The object of this study is to ascertain the total annual income which the people of the United States derive from each of the leading industrial fields. The method used for ascertaining this total for each industry is first to find out how much income is withdrawn from the industry for individual use and then to add to this amount the total savings made during the year and retained in their business by all the enterprises engaged in the industry in question.

§ 1b. Business Savings Counted as Income

That business savings really constitute a part of the national income for the year in which they are made has been denied by some students of the subject. The ground for their contention is that such savings merely make possible an increase in the income of future years and hence should be ignored in the income report of the year when the saving is done.

This method of treating business savings, though plausible, is open to grave objections. The income with which we are dealing throughout this study is *book* income, that is the amount shown as net gain by an accurate accounting system and is radically different from psychic income which accrues only when the goods render service to the consumer. In the accounts of practically every business, the net income as recorded includes the annual surplus as well as all disbursements to stockholders or owners. This uniform policy shows that a consensus of opinion exists among accountants that savings are a form of income. If the accountants are wrong, we are driven to the conclusion that the amount of the annual income of a corporation may be altered greatly by a vote of the directors, concerning the disposition of earnings! Furthermore, when a corporation reports increased net earnings, even if no dividends are declared, the stock tends to rise sharply in value, and any stockholder may at once realize personal income by selling his shares at the enhanced price. For the reasons stated, it seems best to include business savings in the income for the current year.

§ 1c. Net Versus Gross Disbursements

A number of the great industrial fields of the United States are dominated by corporations and, in such cases, a study of the income created by

the industry is mainly an analysis of corporation reports. This is emphatically true in the case of the various branches of transportation. Now corporations do not show in their published reports the amounts of interest and dividends disbursed to private individuals as contrasted with sums of similar nature paid to other business enterprises. But in making up a total of income for the country, these inter-business payments must be eliminated to prevent duplication. The method adopted for accomplishing this result is to deduct from the sum of interest and dividends paid out by a corporation all bond interest and dividends received from other corporations. This plan rests upon the principle that the corporation making the final payment is, in this instance, merely an intermediary between the original corporation and the private investor. This principle seems to be logical although its application occasionally gives rise to certain difficulties in differentiating between disbursements and business savings.

§ 1d. What the Net Value Product Includes

The net value product of each industry is assumed, for the purposes of this study, to include the returns for the services of all persons engaged in the industry, whether these persons are proprietors or employees, and of all property aiding in the productivity of the industry. It has, for example, been assumed that the stockholder or other entrepreneur owning an equity in a plant, the holder of the mortgage on the plant, and the lessor of property utilized by the business are all alike dependent upon the gains of the enterprise for at least part of their income, and hence may all be classed together as being owners of property devoted to the undertaking.

§ 1e. Estimating Individual Income from a Study of the Product of Industries

Owing to the form in which the data for some industries are available, it is impossible to estimate directly the amounts of income derived from them by individuals or saved by the business enterprises in the industry. In such instances, one naturally has recourse to the alternative method of subtracting from the gross output of the industry in question all payments made to other industries for the materials or services which they have contributed. In following this method, the ideal course of procedure, in the case of any industry, is to deduct from the gross value of its products not only the cost of materials used but also such payments as freight and insurance charges, bank interest, and those taxes which represent the value of government aid and protection, furnished to the industry. The amount remaining after these deductions have been made represents the net income—a quantity which may be either saved or distributed to individuals. In general, every industry is credited with all goods sold to dealers, consumers,

or other industries, and debited with all indirect or production goods received from other industries. Government, like any other industry, ought to be credited with the value of its services and debited with the indirect or production goods received from other industries. An industry can never be debited with charges for direct or consumption goods,¹ for these are not used to further its business or add to its output.

Just as industries pay freight charges for the services of railways, so they also pay taxes to meet the cost of government. In so far as the tax money buys from government indirect (production) goods or secures services in the form of protection or assistance to the industry, the industry in question evidently ought to be debited with the tax just as it is debited with freight charges. In so far, however, as the tax money paid by an industry goes not to pay for aid to the industry but instead to buy direct government services to individuals, the industry cannot justly be debited with such taxes; for, in such cases, the services of government are not business aids but are forming part of the consumable income of individuals and therefore fall into the category of direct services—a class which, according to the principles enunciated above, are never to be charged against an industry.

This line, however, between the taxes that theoretically should and theoretically should not be deducted from the gross value of an industry's output is impossible to draw in practice. Statistically, the only feasible course is to deduct all of the taxes levied on the business.² Such a deduction inevitably gives rise in most instances to an error in the final results—unfortunately only one of several types of unavoidable error to which it is necessary to call attention at this point.

§ 1f. Impossibility of Measuring Value of Government Service to Business

One of the most serious of these errors arises from the impossibility of dividing all services rendered by the various branches of government into two classes, namely:—

1. Those rendered to business.
2. Those serving the people directly.

This impossibility has compelled us to act on the basis of the assumption that the taxes levied against each field of business are equivalent to the value of the service rendered to that industry by government. This assumption is, however, likely to be far from the truth. In 1918, for example, manufacturing corporations paid to the Federal Government \$2,112,044,-

¹ Expenses for welfare work, for example, are not deductions from the value product of an industry.

² See Volume I, Chapter 2, Sec. IV for a further discussion of this point.

810 as income tax, war profits tax, and excess profits tax, and considerable additional amounts were paid by individual manufacturers and partnerships operating in this field. Exact statistics are not available, but the indications are that the entire agricultural industry did not pay to the United States Government over \$100,000,000 in these classes of taxes.¹ It seems highly improbable that in 1918 the Federal Government rendered to the manufacturing industry service valued at more than twenty-times that furnished to agriculture. It may well be that the aid of the National Government to the farmers' business was worth more than \$100,000,000 but it scarcely appears credible that the manufacturers received service worth over two billions. According to the plan followed in this study, however, the two billions have been considered as an expense to the manufacturing industry and deducted. Any part of this amount which is in excess of the value of the services of the Federal Government to the manufacturers, represents a forced contribution to the general welfare and should, in order to obtain the correct figures for 1918, be added to the net value product of manufacturing recorded in this study.

If this type of error results in an underestimate of the income arising from manufacturing, it may, on the other hand, show too high value products for some other fields; for industries may exist which government has served much but taxed little. Unfortunately it is not at all certain that the errors arising from this source cancel out, for we cannot measure even approximately the total value of the service rendered to business by government. It seems likely, however, that, since 1917, business taxes have been more than sufficient to pay for the services rendered to business by all branches of government. If so, this excess should be added to the total income as reported in this study in order to obtain the correct total for the nation.

§ 1g. Are Corporate Surpluses Accurately Reported?

Another possible source of grave errors is found in the estimates of the business savings of the various industries. In most instances these estimates have been based upon reported surpluses of corporations operating in that field. It, therefore, becomes a question of prime importance to know whether the reported size of such surpluses is reasonably close to the truth or whether the stated amounts are far too large because of failure to allow sufficient amounts for depreciation, or are entirely too small, because many improvements have been charged to operating expenses. Manifestly it is impossible to go behind the returns of the reporting concerns, but it is nevertheless possible to ascertain by indirect methods something about the validity of the accounting systems used by the average corpora-

¹ See U. S. Bureau of Internal Revenue, *Statistics of Income*, 1918, pp. 11 to 16.

tions. If reported surpluses are genuine, they should add to the earning power of the companies accumulating them in proportion to the ratio which these surpluses bear to the total of previous investments. An investigation by Mr. Knauth indicates that, in practice, earnings have increased in just about this proportion. It appears, therefore, that no great error is likely to arise from the practice of accepting as accurate the amounts of surpluses reported; hence this practice has been adhered to throughout this study.

§ 1h. Minor Errors and Irregularities in the Tables

It is perhaps wise at this point to mention certain mathematical details connected with the presentation of data in the accompanying tables. The basic figures in most instances have such a margin of error that errors in multiplication or division arising from the use of a 12 inch slide rule are of negligible importance, hence this instrument has been frequently used. The result is that a computation by more accurate means will occasionally reveal errors in the fourth significant figure.

In numbers of instances, original computations have been carried to more places than are shown in the quantities entered in the tables here presented, hence it follows that an item in a total column may differ slightly from the nominal sum of the items in the columns from which the total is derived.

Owing to the inherent characteristics of the decimal system, when all of the percentages composing a whole are read to any given decimal place, the recorded items may not add up to exactly 100. The same principle applies to decimal fractions. The quantities have been correctly entered, no attempt being made to obtain a total of 100 (or of 1, as the case may be), by distorting the component parts.

§ 1i. Possible and Probable Errors of Estimates

It is, of course, impracticable to estimate with accuracy the size of the possible or probable error in each of the items entering into the total. However, it is clear that the likelihood of error is far greater in some instances than in others. An attempt has been made, therefore, to record for each of the principal items two estimates of error: namely, *the probable*, and *the maximum reasonable*. *The probable error* is defined as being such that the chances are even that the error is greater or less than the amount stated. *The maximum reasonable error* is defined as being so large that the chances are ten to one that it will not be exceeded. The 1918 estimates for these errors of the various items follow:

TABLE 1A

ESTIMATED ERRORS IN THE ITEMS OF THE NATIONAL VALUE PRODUCT IN 1918

Industry	Division	Millions of dollars		
		Size of item	Probable error ^a	Maximum reasonable error ^b
Agriculture.....	Crops	7,119	500	1,500
".....	New Land	405	200	600
".....	Animal Products	6,189	500	1,200
".....	Deductions	-1,031	200	400
Mineral Production.....	Wages and Salaries	1,422	70	250
".....	Rent	214	40	80
".....	Savings	79	20	70
".....	Remainder	298	30	100
Factory Production.....	Wages and Salaries	12,378	200	600
".....	Rent	137	70	200
".....	Remainder	3,503	300	800
Construction.....	Wages and Salaries	964	150	400
".....	Remainder	317	100	250
Automobile Repairing.....	Total	367	90	180
Laundry.....	Wages and Salaries	106	15	35
".....	Remainder	84	15	70
Custom Grist Mills.....	Wages and Salaries	2	1	2
".....	Remainder	13	8	15
Custom Saw Mills.....	Wages and Salaries	2	1	2
".....	Remainder	3	1	3
Shoe Repairing.....	Total	111	50	140
Tailoring, Dyeing & Cleaning.....	Total	661	150	500
Repair of Machines.....	Total	61	40	75
Blacksmithing.....	Total	210	80	300
Custom Dressmaking.....	Total	83	70	120
Railways, Switching & Terminal Companies.....	Wages and Salaries	2,763	10	100
Railways, Switching & Terminal Companies.....	Remainder	807	50	250
Pullman Co.....	Wages and Salaries	24	3	7
".....	Remainder	10	1	4

^a Even chances.^b Ten chances to one that the error is not larger than this amount.

TABLE 1A—Continued

Industry	Division	Millions of dollars		
		Size of item	Probable error	Maximum reasonable error
Express Co.....	Wages and Salaries	93	1	3
“ “.....	Remainder	—14	3	7
Street Railway.....	Wages and Salaries	314	10	35
“ “.....	Remainder	124	10	40
Commercial Electric Light & Power.....	Wages and Salaries	97	5	15
Commercial Electric Light & Power.....	Remainder	160	20	50
Telegraph.....	Wages and Salaries	49	2	8
“.....	Remainder	18	2	9
Telephone.....	Wages and Salaries	194	5	15
“.....	Remainder	85	6	20
Transportation by Water.....	Wages and Salaries	421	30	150
“ “ “.....	Remainder	85	20	60
Banking.....	Wages and Salaries	281	20	60
“.....	Dividends	87	15	30
“.....	Surplus	194	6	20
“.....	Remainder	204	15	70
Government.....	Federal	3,814	200	600
“.....	State and County	384	30	100
“.....	Municipal	707	30	150
“.....	Municipal Utilities	39	4	15
“.....	Schools	578	15	100
“.....	Deductions	—170	20	50
Unclassified Industries.....	Wages and Salaries	7,022	400	1,200
“ “.....	Corporate Profits	1,047	100	400
“ “.....	Individual Profits	4,601	700	1,600
“ “.....	Rents	263	80	400
Miscellaneous Income.....	Urban Agriculture	364	80	240
“ “.....	Home Rental Value	1,237	200	600
“ “.....	Interest on Consumption Goods	1,275	200	600
Total.....		60,854	5,194	14,900
Probable Error of Total.....			1,266	
Maximum Reasonable Error of Total.....				3,566

The estimated probable error of the total, as computed by the usual formula from the items given, amounts to 1.3 billions. The maximum reasonable error of the total as shown by an experimental test with the items given appears to be about 3.6 billions of dollars. The evidence

indicates, therefore, that the total is close enough to the truth to meet the needs of most students of the subject, the error presumably being not greater than six per cent and perhaps very much less.

Since the errors for the other years of the decade are presumably similar in proportionate size to those in 1918, no separate computations have been made therefor.

§ 1j. General Plan of Presenting Estimates

The general plan of exposition determined upon is to attempt to show for each of the leading industrial fields covered by the Census:—

1. The net value product.
2. The share of the employees in the value product.
3. The average annual earnings derived from the industry by each employee.
4. The share of the entrepreneurs and other property owners in the net value product.
5. The purchasing power of each of the above items at prices of 1913.
6. Changes in the physical output per employee.
7. Changes in the physical output per inhabitant of the United States.
8. The average number of employees actually at work
9. The average number of employees attached to the industry.

Frequently it has been possible to determine from the available figures other facts of interest and these facts have been worked out to a limited extent.

In some cases, however, since it has not been feasible to cover even the standard list of inquiries, results have been presented which are not entirely complete.

While an effort has been made to outline the general *modus operandi* in most instances, it has been found impracticable to present all of the details. Those especially interested in the procedure followed may through personal or written inquiry obtain such additional information as the records of the Bureau afford.

§ 1k. Reduction of Values to Money of Constant Purchasing Power

The plan of attack decided upon has required that, in most instances, amounts be first estimated in money of current purchasing power, or, in other words, in terms of book income. The price changes during the latter part of the decade have, however, been so large that comparisons of money values for different years tell practically nothing about the variations that have occurred either in the physical volume of business or in the quantity of goods that the income will buy. It has been necessary, therefore, to convert many items into figures representing values in money of constant

purchasing power. For this purpose, prices of the year 1913 have commonly been taken as standard, this year being the base used by the United States Bureau of Labor Statistics and by numerous other organizations.

The accuracy of the results obtained by such conversions evidently varies in proportion to the correctness of the price indices used as divisors. The United States Bureau of Labor Statistics "cost of living" index has been assumed to be satisfactory for the purpose of reducing wages and salaries to a comparable basis. Since this index has not been computed for the years preceding 1913, it has been necessary to extend it back by means of a special investigation. As a test, this Bureau computed the index for the years 1909 to 1918 and compared the figures for the six overlapping years (1913 to 1918) with the Government figures just mentioned.¹ The fact that the correspondence between the two index series proved very close leads to the belief that errors arising from the faultiness of this index series are not of major importance.

While the general principle to be followed in correcting the income of the working classes is quite obvious, the best method of converting the income from property and enterprise to the 1913 base is not so easy to determine. Since a considerable fraction of personal income of large property owners is invested rather than immediately consumed, the propriety of using an index of prices of consumption goods as a correcting factor for this type of income may well be questioned. Careful consideration has been given to this point, and the conclusion has been reached that no other price index can as legitimately be used for this purpose. Investments are so heterogeneous in their nature that it is difficult to say just what type should be considered and what weight should be assigned to each. Prices of indirect goods, whether stocks of corporations or commodities at wholesale are certainly to a large degree, merely reflections of prevailing opinions of what prices of direct (consumption) goods are expected to be at a later date. In so far as this is true, it appears more logical to base a correcting factor for the present date upon prices having their origin in expenditures for present consumption than upon those reflecting anticipated future needs. After all, expenditures for consumption goods form no mean proportion of the total income of all except the very wealthiest families. It is believed, therefore, that the procedure followed is more logical than any other that can be practically applied.

It might seem reasonable to deal with business savings by using the same method applied to the personal income of the property owners. However, it is evident that the immediate function of the first mentioned type of income is to strengthen the business rather than to purchase consumption goods. Normally such savings are invested in new plants or equipment.

¹ See Section 2b.

For this reason, the policy has been followed of dividing the business savings in each field of industry by an index believed to approximate the changes in construction costs in that branch of industry for the same year.

§ 11. Average Annual Earnings Versus Wage Rates

While average annual earnings do not always give a good picture of the absolute economic condition of the employees in an industry at a given time, they are usually distinctly valuable as indices of change in welfare from year to year. The wide difference in nature between wage rates and earnings should not be overlooked. Wage rates measure the price of a specific amount of labor; earnings are connected more closely with the economic welfare of the employee and his family. Earnings may be materially reduced by a shortening of hours or an increase in unemployment at the same time that wage rates are stationary.

The United States Census Bureau commonly reports for various industries the total amount of wages paid and the average number of wage earners employed. If the first quantity is divided by the second, the quotient represents approximately the average earnings of a full time worker,¹ rather than the average earnings of the workers who normally make their living in this field of endeavor. To obtain average annual earnings, it is necessary first to estimate for each year the average number of workers attached to the industry and then to divide thereby the aggregate of wages paid. Such an estimate has been made for each industry. The mode of estimating the number of employees attached to, or in other words, normally making their living in a given industry, is discussed in Chapter 2.

§ 1m. Interest Payments on Consumption Loans Not Deducted from Income

One of the most puzzling theoretical problems encountered during the investigation has to do with interest on loans made for the purpose of purchasing goods for direct consumption. Does sound logic require the deduction of such interest payments from the gross income of the borrower, when calculating his net income? The practical bearing of the question is principally in connection with the Liberty Loans which represent billions borrowed from the bond buyers by the citizens in general in order to obtain such immediately consumable war supplies as powder and shells. The bonds were originally held by persons advancing money to relieve others from paying at that time their respective proportions of the cost of the war. This advance of money did not necessarily add anything to the aggregate

¹ A full time worker is one who works the number of hours designated by the employer as "full time." For a fuller discussion, see § 2d.

of the actual physical product. It merely meant that potential taxpayers retained too large an income during war time on the understanding that they pay a bonus, known as interest, for the privilege of meeting, from later income, their full share of the burden. It may be contended, therefore, that if interest receipts are included in the total income of the people, it is only fair to deduct these amounts from the incomes of the taxpayers.

The opposite point of view which has led to the inclusion of these interest payments in the net value product is that the advantage to the taxpayers of being allowed to postpone the time of payment was evidently felt to be real enough to make them willing to pay money for the privilege. Furthermore, if the taxpayers feel that the privilege of postponing the assumption of their respective shares of the burden is not worth the interest charge, they always have the option of paying off the debt. According to the definition followed in this study, an advantage of the type just mentioned is a service which constitutes income, and such income must be added to the actual physical product in order to arrive at the net value product, or in other words, at the total income of the country.

Similar reasoning applies with equal force to interest on all sums borrowed for the purpose of obtaining consumption goods, whether the borrowing is done by government or by private individuals.

While the arguments just stated have seemed to be weightier than any on the opposite side, it must nevertheless be admitted that a strong case can be presented for pursuing the opposite course in this computation and for this reason, government interest payments have been segregated so that those who prefer may subtract them from the estimates of aggregate national income for the various years (as presented in Volume I), in order to secure totals according with their beliefs.