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Source: *Journal of the Royal Statistical Society*, 1933, Vol. 96, No. 4 (1933), pp. 651-659

Published by: Wiley for the Royal Statistical Society

Stable URL: <https://www.jstor.org/stable/2341902>

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## THE NATIONAL INCOME AND THE NET OUTPUT OF INDUSTRY.

By COLIN G. CLARK, M.A.

THE measurement of the national income, both in the determination of the absolute total and in the still more important matter of the measurement of the changes from year to year, is a subject which has as yet engaged the attention of very few investigators in this country, and one on which a wide measure of disagreement is possible. The purpose of this note is to discuss certain differences between my own recent estimate (*The National Income, 1924-31*, Macmillan) and those of other investigators.

Bowley and Stamp's estimate for 1924 of the net or social income of this country was £3,803 m. My own estimate, prepared by a similar method from statistics of Income Tax assessments and from estimates of the total paid in wages, etc., was £3,586 m. The main difference was in the total of wages, which they estimated at £1,600 m. and which I estimated at £1,413 m.

I have not differed, except by a very small amount, from Sir Josiah Stamp in his interpretation of the income tax statistics for 1924. Apart from the difference in the estimate of wages mentioned above, which I discuss fully elsewhere (*The National Income, 1924-31*, pp. 58-61), there is also a smaller difference between our estimates for the totals of "intermediate" incomes. This matter will be referred to again below.

For the years subsequent to 1924, my estimates show a considerable rise up to 1929, in which year I estimated the total money national income at 11·4 per cent. above the 1924 level. This was followed by a fall, and for 1931 I estimated £3,499 m., or 2·4 per cent. below 1924. *The Economist* (29th October, 1932) suggested that the 1931 figure should show a greater fall from the 1924 level, while Dr. W. H. Coates (*Manchester Statistical Society Proceedings*, 15th December, 1931) estimated a fall of £371 m. between 1924 and 1931. His totals refer to gross income and not to net social income, but there has been no considerable change over this period in the deductions which have to be made.

*The Economist* (loc. cit.) suggests that I have over-estimated the total paid in wages for 1931. The writer does not disagree with my estimate of the number of wage-earners, which is based on social insurance statistics, but suggests that the London and Cambridge Economic Service index-number of wage-rates which I use must be unrepresentative, and he demands that the Ministry of Labour should compile an index-number of wage-rates which "even if not absolutely complete, would be better than the best efforts of private enterprisers."

This has now been done (*Ministry of Labour Gazette*, March 1933, and *Bank of England Statistical Summary* for same month). But the result is a remarkable confirmation throughout of Dr. Bowley's previous index-number. For the average over 1931, Dr. Bowley's figure transferred to the average of 1924 as base, is 97·9, and the Ministry of Labour's figure is 97·6.

The difference between Dr. Coates' estimate, showing a fall of £371 m. between 1924 and 1931, and mine, showing a fall of only £87 m., if we neglect certain minutiae, can be analysed into three elements. The first, corresponding to a difference of £102 m., represents only a difference of definition. Changes in the valuation of stock-in-trade may have a big effect on the money national income at certain periods, and may give rise to an incomparability between Census of Production figures on the one hand, and Income Tax assessments and other profit statistics on the other hand (cf. the discussion reported in the *Journal of the Royal Statistical Society*, Part II, 1929). In the light of this discussion, I have based my work on the definition that when the physical quantity of stocks has remained unchanged, but their price has fallen, this is not to be regarded as a deduction from income. After allowing for this difference, Dr. Coates' estimates of 1931 profits are still considerably lower than mine. Finally, he estimates that the total paid in wages fell by £190 m. between 1924 and 1931, my estimate showing a fall of only £37 m. Dr. Coates does not give any information as to the methods by which his estimate of wages is compiled.

Bearing in mind the different treatment of the figures of stocks, it is possible to check my estimates of the totals of profits and interest against the broader of Sir Josiah Stamp's\* two index-numbers of profits, which he describes as indicating the whole return, apart from wages and rents, upon businesses of all kinds (*J.R.S.S.*, 1932, pp. 670-71). In the following table I have re-expressed my own estimates (Table XXV in my book) after deducting the corrections which I had introduced for stock valuations (Table XXIV), in order to put my figures on a comparable basis with Sir Josiah Stamp's.

*General Profit Index-Numbers, 1924-31.*

	1924.	1926.	1927.	1928.	1929.	1930.	1931.
Stamp .....	100	98·3	106·5	106·2	109·9	100·9	90
Clark .....	100	99·4	104·0	105·9	111·8	104·2	84·3
Coates .....	100	—	—	—	—	—	75·5

\* Sir Josiah Stamp has now (*The Times*, 9 August, 1933) amended the last three data so as to read: 1929, 106·8; 1930, 94·4; 1931, 84·0.

Considering the very different methods by which the first two estimates were prepared, and that they were prepared quite independently, the agreement is quite satisfactory.

The whole of my work on this national income has been vehemently attacked by Dr. Snow. His first criticism is that my estimate for the number of employers and independent workers in 1928 is too low by some 370,000, and my estimate of the number of salary earners too high by the same amount. But we must maintain a due idea of proportion. Even if my figures are in error to this whole extent, the estimates concerned being those relating to incomes outside the scope of income tax, and as the average incomes of the two classes concerned are £96 and £100 per annum respectively, the total estimate of the national income can only be altered to the extent of just over £1 m.

If, for the sake of argument, we also accept for the moment Dr. Snow's further contention that the average income of the whole of the former class is not £96 but £120, it still only affects the total national income by £16 m., or 0.4 per cent.

Dr. Snow disagrees with my estimate, based on extrapolation, which shows a considerable fall in the number of employers and independent workers between 1921 and 1928. I was aware that the figures used as a basis for extrapolation are incomplete, although there may be differing opinions about their degree of reliability. But this fall which I have estimated in their numbers is supported by other evidence, particularly a comparison between population and Health Insurance statistics. Almost the whole of the fall which I have estimated is among males, at the rate of 37,000 per annum over the period 1921-8. The average rate of increase of the male population aged 16-70 over this period was 139,000 per annum. It is difficult to get comparable Health Insurance figures over the whole period 1921-8, owing to the change in the value of money bringing additional numbers below the £250 limit, the exclusion of a number of men from Health Insurance owing to unemployment, and the break in the figures in 1928 due to the change in the upper age limit. But if we take 1922 as about the period when incomes and unemployment settled down to their general post-war level, we find that between the end of 1922 and the end of 1927 the average annual rate of increase of the number of insured males was 175,000 per annum, or 36,000 per annum greater than the increase of population. It is clearly improbable that there was any considerable change in the small number of unoccupied adult males, and although there were some changes in the administration of Health Insurance over this period, I think the figures point to the conclusion that there was a considerable

decline in the number of "independents" and small masters over this period. I think I am right in saying that the generous extensions of social insurance benefits which were made in 1925 had the effect of definitely attracting numbers away from independent work or partnership into paid employment. Not being able to secure access to the Census data, however, it is only by such means as this that one can hope to make any estimate at all of the changes in numbers of this class.

Next arises a matter already referred to, namely, the estimation of the average income of the small shopkeepers, hawkers, independent workers, etc. not assessed to Income Tax. For this purpose, requiring as we do to take account of the changing levels of the Income Tax exemption limit, we need some knowledge of the frequency distribution of incomes within this range. Dr. Snow sees fit to make fun of the frequency distribution which I use and says that the probable error must be very large. But I think he must have made some miscalculation. In the averages which I obtain the error cannot be greater than some 5%.

The only possible source from which we can hope at the present time to obtain this information is from social surveys, such as the New Survey of London Life and Labour and the Social Survey of Merseyside, which are now both approaching completion. I am sorry that on this matter figures are as yet only available from one of the two Surveys, and I hope the London figures will be available shortly. Those acquainted with these Surveys (I have served on the staff of both of them myself) will know the trouble taken to ensure that the sample is truly random. In these data the phrase "net income" means, of course, the proceeds of the business after deducting cost of materials and rent attributable to the shop or workshop.

The sample which I have used has the admitted defect of only being representative of one area. But (let there be no mistake about this) there is no alternative approach to this problem. Lacking such information, Bowley and Stamp had to use an estimate, relating to some 600,000 incomes, based on pure guesswork (cf. page 26 of their book). An estimate based on scanty data surely cannot be worse than an estimate based on no data.

Dr. Snow states that the average income of this class is £120 (as against my estimate of £96), his grounds being "knowledge of the frequency distribution of incomes in general." I do not know to what sources he is referring. Apart from certain highly speculative estimates, obtained by drawing Pareto curves, our only present information on the frequency distribution of small incomes is the information on the numbers of salary earners at different levels collected by Bowley and Stamp for 1924, information which I have

also made use of. In this the average of all incomes below £159 works out at £100. In their very rough estimate described above for small employers and independent workers (excluding farmers), Bowley and Stamp estimate £98 for the average of all incomes below £150.

I do not attach very great importance to my estimate showing a fall in the numbers of employers and independent workers between 1921 and 1928. I believe the trend has changed since 1928. I should probably be ready to agree with Dr. Snow's estimate of 1,600,000 for 1928, if he would give the methods by which it is calculated. But I certainly will not agree with his complementary contention, that I have over-estimated the number of salary earners. My estimate of an increase in the number of assessable salary earners from 1,715,000 in 1921 to 2,420,000 in 1928, or at a rate of 100,000 per annum, he describes as "so surprising that it should surely have arrested attention." Over the five years 1925 to 1930 (the series is broken at the beginning and end of this period by administrative changes) the numbers liable to income-tax increased by 500,000. Of this total, increased assessments of wage earners represented £26 m., corresponding to not more than 150,000 persons.

In actual fact my estimate of a big increase in the number of salary earners has just been supported in a striking manner, or, if anything, shown to be too low, by a new piece of evidence. The Emergency Budget of 1931 lowered the exemption limit for earned incomes from £162 to £125, and the last report of the Board of Inland Revenue gives the number of taxpayers under the new law at 8,400,000. Of these, I understand that 3,000,000 represent wage-earners. This means that in 1931 there were 5,400,000 non-wage-earners with incomes over £125 (excluding married women). The number of salary earners with incomes over £125 I estimated to represent 68 per cent. of the total of salary earners in 1921, 72 per cent. in 1924 and 77 per cent. in 1928. For entrepreneurs I estimate the current figure at 69 per cent. Whichever figure we take, it is clear that the total number of non-wage-earners in receipt of incomes in 1931 was at least 7,000,000. The total in 1921 as estimated by Bowley and Stamp was only some 5,750,000,\* and it

\* Salary earners, entrepreneurs, and unoccupied income-recipients, together with shop-assistants, who were reckoned as wage-earners by Bowley and Stamp, but who are included in the statistics of salary earners by the Inland Revenue.

I think the income of shop assistants, totalling perhaps as much as £100 m. in 1924, may account for a considerable part of the puzzling discrepancy between Bowley and Stamp's estimates and mine for that year. This total would apparently have been reckoned by them as wages and by me as salaries. Their total estimate of the national income for 1924 would appear to contain a certain amount of duplication; at the same time my estimates of the changes in the proportion of the national income taken by wages will be vitiated.

With the majority of the criticisms recently made by Prof. Bowley (*Economica*, May 1933) I am in agreement.

is fairly clear that the main increase has been in salary earners, with probably a smaller increase in the number of unoccupied income-recipients. My estimate of an increase of less than a million in the number of salary earners between 1921 and 1928 perhaps even errs in being too low.

Another respect in which my results have been very strongly attacked, both by Dr. Snow and by others, is in my estimates of the value of industrial production for the years since 1924. I was writing before the results of the 1930 Census of Production were available, and was setting out to make estimates of the gross and net value of industrial output for the years up to 1931. The only information available for years other than Census years consists of (i) index-numbers of production, showing the physical quantity of output of a number of intermediate commodities, but of comparatively few finished goods, (ii) Ministry of Labour statistics of the numbers employed in different industries, (iii) price indexes relating to exported manufactures.

These index-numbers of the prices of exported manufactures are, of course, a *pis aller*, although by re-weighting them, as I have done, in accordance with the relative importance of different commodities in total output instead of their relative importance in export, the validity of the index figures is improved. Their use is necessary because there is simply no other information available on the prices of finished manufactured goods, and it is impossible for a private investigator to collect the information from original sources. In this country neither our official nor our various private index-numbers of wholesale prices give any information on the prices of finished manufactures. Of course it is not easy to collect statistics of these prices, but a task which has been proved possible in the official index-numbers of Germany, U.S.A., Sweden and Canada should not be beyond the British Board of Trade.

Use of this already inadequate material is made still more difficult by the fact that the Board of Trade and the Ministry of Labour use an almost completely different system of industrial classification.

My method of estimating is to obtain for each year a figure for the total value of the final product of industry, and to deduct from this, in order to estimate the net output, the cost of primary materials, transport services, etc. In obtaining the figure for the final product of industry, certain constituent items such as the value of buildings can be estimated directly, and the remainder is estimated by a sort of weighted index-number. Taking the values of the output of various classes of finished goods in the Census year as bases, three multipliers are applied. The first represents the change in employment and the second the change in prices

relevant to each class of commodities, while the third is a flat-rate multiplier applied to all classes to represent the general change in the quantity of output per person employed. This last is calculated from such figures of the quantity of production in different industries as are available.

Such a method, assuming as it does a uniform rate of increase in output per head in the different industries, cannot be used to give results for individual industries, but should be valid for estimating the total net output of industry. The proof of the pudding must be in the eating. My calculation was made before the results of the 1930 Census were available, and it can be checked against the results subsequently published.

From published data from the 1930 Census of Production, covering some 90% of industry, the whole net output of industry in Gt. Britain in 1930 may be reckoned at some £1,597 m. (cf. *Economic Journal*, 1933, p. 216).

An alternative method of calculation, which avoids the difficulties of outstanding returns and small firms, is to take the Ministry of Labour employment figures, which are comprehensive, and to multiply these by the net output *per head* returned in the Census of Production (except for Public Utility trades, where the Ministry of Labour figures are incomplete, and the Census totals must be used as before). This gives an almost identical result.

My estimate comes within £56 m., or 3½ per cent. of the correct figure. This is a very satisfactory agreement when we consider that it represents an estimate of the difference between two unknown quantities and also when we remember the rapidly fluctuating conditions of 1930. Imports of raw materials, for instance, were £562 m. in 1929, £441 m. in 1930, and £336 m. in 1931. For convenience I assumed that these materials were used by industry without lag in the same year as they were imported. If I had lagged my figures a month or two I should have got even closer agreement.

Accurate knowledge of conditions as they were three or five years ago is no compensation for a lack of information about present conditions, and in fact is often of less value than the roughest estimates which can be kept fully up to date. This will always be the *raison d'être* of such estimation as I have described above, in anticipation of the results of the Census of Production, subject, of course, to the proviso that we must be constantly checking and revising our methods and results as fuller data become available.

I began to work at this problem over three years ago as part of my duties on the staff of the Economic Advisory Council. Some of my work was later (not at my suggestion) submitted to the MacMillan Committee, and I was asked to give evidence before



them. The first table which I prepared went on the assumption that the net output and gross output of certain industries moved in proportion. This table has been criticized by Dr. Snow on several occasions—quite rightly. All that can be said in its defence is that it was one of the first attempts made by anybody to secure a calculation on these lines, and that it only refers to the period up to 1929, during which period relative price-changes were not very violent. I hope Dr. Snow will think better of me when I say that I myself tried to prevent its being published in the MacMillan Report, but was unable to do so. I have not used its results in any subsequent calculations.

I think it is justifiable to hark back to 1930 like this, because an ounce of information available at the time is worth a pound available later, and it would have been very little use to tell the MacMillan Committee that the results of a census of industrial production would be available in two and a half years' time. Although I may have been wrong in a number of details, I think I was right in emphasizing, actually at the time, the general conclusion that the value of net output per person employed in industry was about the same in 1930 as in 1924, a result subsequently confirmed by the Census of Production. At that time I concluded that the money national income in 1929 had been much higher than in 1924. These views were at the time strongly opposed by the Board of Trade and by other statisticians, who held that the national income in 1929 was very doubtfully in excess of 1924, and in 1930 was very much lower. Although my views, as a junior civil servant, were then mainly disregarded, I think it is only fair that I should now be able to claim the barren privilege of saying "I told you so"!

[*Editorial Note.*—Mr. Clark's article is a reply to the review of his book *The National Income* published in Part I of the *Journal*. The review criticized the statistical basis of the book, and there is nothing in Mr. Clark's article to change our view that his methods are so faulty that his results must be omitted in any serious discussions on the question of the national income.

We pointed out a serious error in one of the early estimates which influenced a number of other calculations in the book. Mr. Clark, by a most rash piece of extrapolation, reached the figure of 1,235,000 as the number of male "employers and independent workers" in Great Britain in 1928, the Census figure of 1921 being 1,493,000, made up of 1,312,400 in England and Wales and 180,700 in Scotland. As the actual Census figure for 1931 for England and Wales can now be quoted we think it should at once be put on record in order to avoid further controversy. It was 1,492,602,

showing an *increase* of 14 per cent. in the ten years in England and Wales compared with the *decrease* of 17 per cent. in eight years in Great Britain claimed by Mr. Clark. As Mr. Clark believes "The trend has changed since 1928" we refrain from interpolating the Census results to obtain a figure for 1928, but we should be very surprised indeed if, in fact, the number of "employers and independent workers" did decline from 1921 to 1928 and then subsequently rise again to the level indicated by these figures.

A further fallacy in Mr. Clark's statistical investigations should be brought to the attention of economists. In an article in the *Economic Journal* in June last he found a correlation coefficient of .86 between the Sauerbeck Index-Number and Great Britain's income from overseas investments over the period 1922-31. On the strength of this he extrapolated for the overseas investment income for 1932 and reached a figure considerably higher than that published by the Board of Trade in February last, and concluded: "I do not think the Board of Trade have given adequate grounds for their estimate of a further heavy fall between 1931 and 1932." A high correlation coefficient is a comforting thing, but it gives no sound ground for accepting an extrapolated figure rather than direct evidence relating to the year in question, when that year was so vastly different in many respects from the previous decade. In case economists are inclined to place credence on the importance of the correlation coefficient in calculating national income from the Sauerbeck Index-Number we will enlarge on this point. The correlation coefficient over the nine years 1923-31 worked out in a similar manner to that used by Mr. Clark is even higher than he obtained for the ten-year period, namely, .89. Supposing nobody had been interested in obtaining ten years ago by direct investigation the magnitude of the overseas investment income in 1922, but now required to calculate it, he might be led to employ such a formula as that used by Mr. Clark for the purpose. By extrapolation for the year previous to the period on which the correlation was based instead of the year following he would have reached a figure for 1922 of £204 million. In actual fact, the figure for 1922 was obtained years ago by direct investigation and it was found to be £175 million, a figure which has never been questioned during the past decade. The figure calculated by the coefficient of correlation would have been in error, accordingly, by about £30 million. Mr. Clark's extrapolation for 1932 may be just as much in error as the similar calculation made for 1922, and the use of a correlation coefficient affords no justification whatever for criticizing the Board of Trade estimate. E. C. S.]

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