CHAPTER V

DESCRIPTION OF THE MODEL. INCOME FORMATION

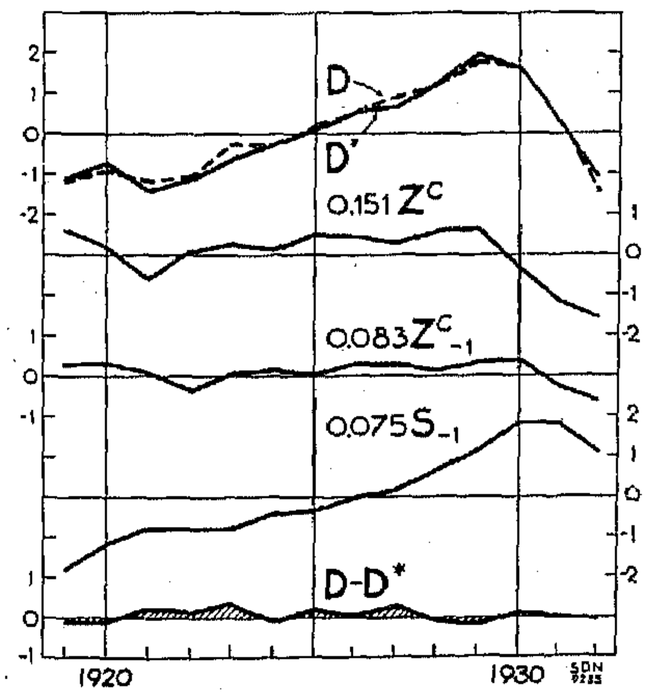
(5.1) "Explanation" of Dividend Fluctuations

Dividends may be expected to be chiefly determined by profits and reserve position. Both factors may work with some lag. The relation to be tested has therefore been given the form:

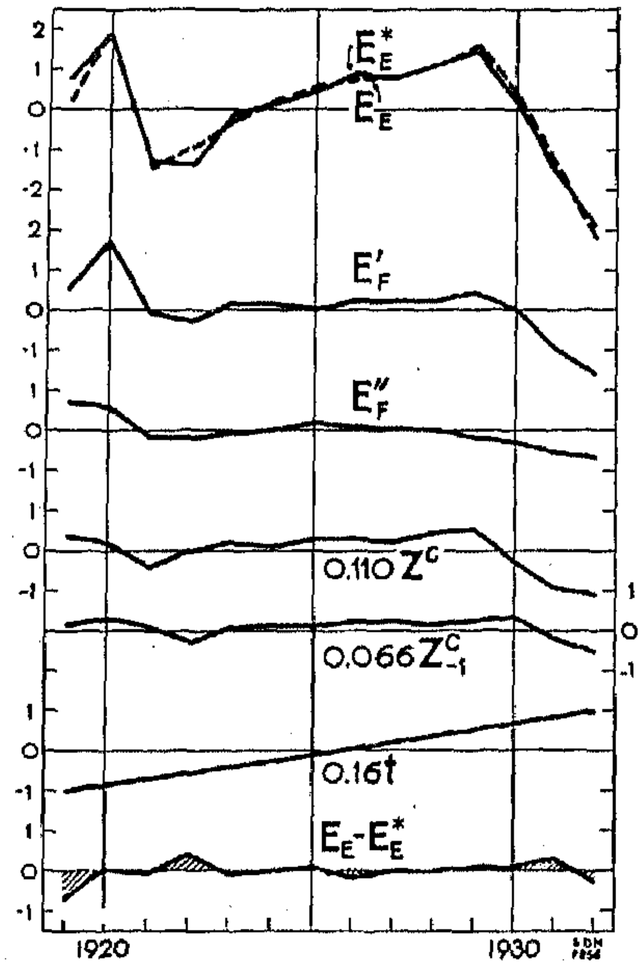
$$D = \delta_0 Z^c + \delta_1 Z^c{}_{-1} + \delta_2 S_{-1}$$

It is not necessary to include S, as S will be dependent on S_{-1}, Z^c and D.

Graph 5.1.
"Explanation" of Fluctuations in Dividends.



Graph 5.2.
"Explanation" of Fluctuations in Entrepreneurial Withdrawals.



The result of the testing is given in equation (5.1) and graph 5.1. A high correlation is found, and a rather high influence of the reserve position.[1] Relation (5.1) runs:

$$D = 0.151Z^c + 0.083Z^c_{-1} + 0.075S_{-1} \qquad (5.1).$$

(5.2) "Explanation" of Entrepreneurial Withdrawals

Entrepreneurial withdrawals are only roughly estimated. Very refined experiments with these figures do not, therefore, seem possible. First, farmers' incomes (in money and in kind) were subtracted. It seemed natural to assume as the chief influencing factors for the remaining incomes:

(i) The general profit situation, which may be best characterised by corporation profits Z^c, and

(ii) A trend, representing changes in reserves.[2]

The influence of the first variable might be lagged, as corporations are probably representative of the more exposed and rapidly reacting part of business life.

A satisfactory fit was obtained with the formula:

$$E_E - E'_F - E''_F = 0.110Z^c + 0.066Z^c_{-1} + 0.16t \qquad (5.2)$$

represented graphically in graph 5.2.

(5.3) "Explanation" of Capital Gains

Capital gains will chiefly depend on the rate of increase in share prices. The only problem which arises is over what period the increase has to be taken. Judging from the distinction which is made in the statistics of income — viz., between gains on

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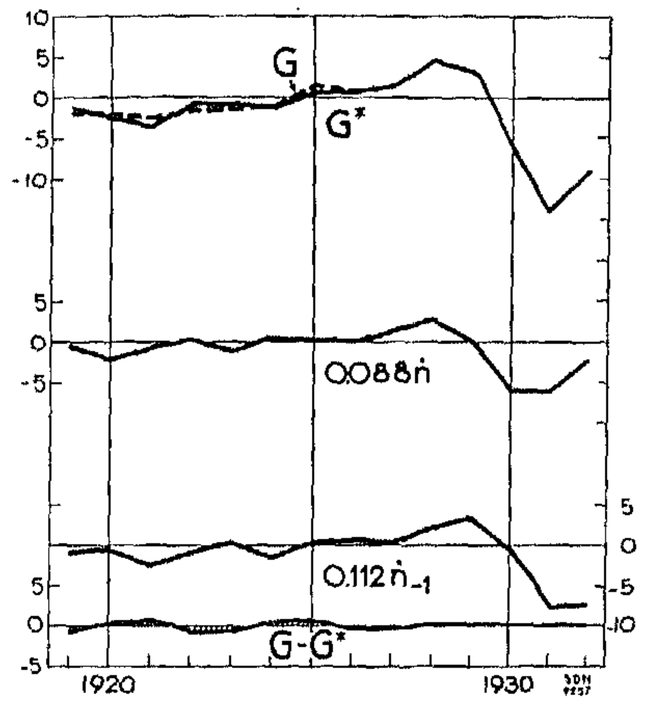
[1] This influence is found to be much smaller in some European countries. *Cf. De Nederlandsche Conjunctuur*, August 1935.

[2] This factor was introduced by analogy with the case of corporation dividends where a large influence of surplus was found. Surplus shows only rather slow movements which, over the period covered, may be approximated by a trend.



Graph 5.3.
"Explanation" of Fluctuations in Capital Gains.
(For the years 1930 to 1932 G has been taken equal to G* for lack of reliable figures.)

assets held less than two years and gains on assets held two years and more — considerable lags seem possible. Statistical investigation confirmed this view, and the best fit was obtained by the formula :

$$G = 0.088\,\dot{n} + 0.112\,\dot{n}_{-1} \qquad (5.3)$$

which means that the average period over which gains were taken was one year.[1] This is, of course, not in contradiction with the above, for the average will no doubt include both longer and shorter lags, the latter originating largely from stock-exchange speculation.

(5.4) "Explanation" of Interest Payments

Total interest payments are the product of "debt outstanding" and some average interest rate. This interest rate is an average of rates for various types of long-term debt[2] — *i.e.*, debts carrying various degrees of risk and incurred at various dates over a considerable period of previous time. Both factors tend considerably to smooth out fluctuations from year to year in

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[1] In fact, $0.088\,\dot{n} + 0.112\,\dot{n}_{-1}$ is very near to $0.20\,\dot{n}_{-0.56}$ (*cf.* page 46, note 1), which again is almost equal to $0.20\,\dot{n}_{-0.5} = 0.20\,(n - n_{-1})$. This expression would be obtained if all capital gains resulted from a holding of one year.

[2] Short-term interest payments have been considered as inter-business payments, as is done by Dr. Kuznets, *loc. cit.*

this average interest rate. Hence only the most marked changes in business-cycle conditions find an expression in it, and even these are smoothed out and lagged. The same is true for the total of debts outstanding, where, in addition, a trend will be present. These two reasons, together with the fairly small size of the fluctuations in total interest payments, are a justification for applying only a rather rough procedure in the "explanation" of these movements. Only two rather general suppositions will be made, — viz.: (i) that the general business position, as measured by Z^c, exerts an influence, and (ii) that this influence is lagged and cumulative in character — *i.e.*, that the values of Z^c for many preceding years also exert an influence. The simplest mathematical expression which reflects both types of force is:

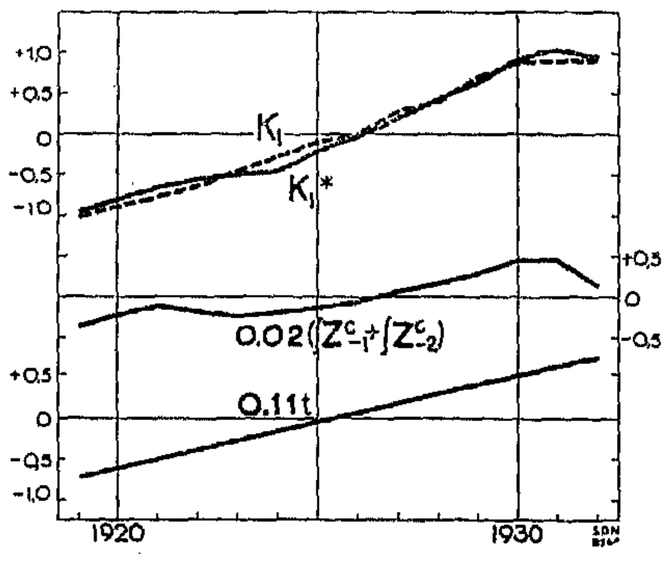
$$K_I = \varkappa_1 \int Z^c_{-1} + \varkappa_2 \int Z^c_{-2} + \varkappa_3 t$$

which has therefore been chosen for testing. The best fit has been found with

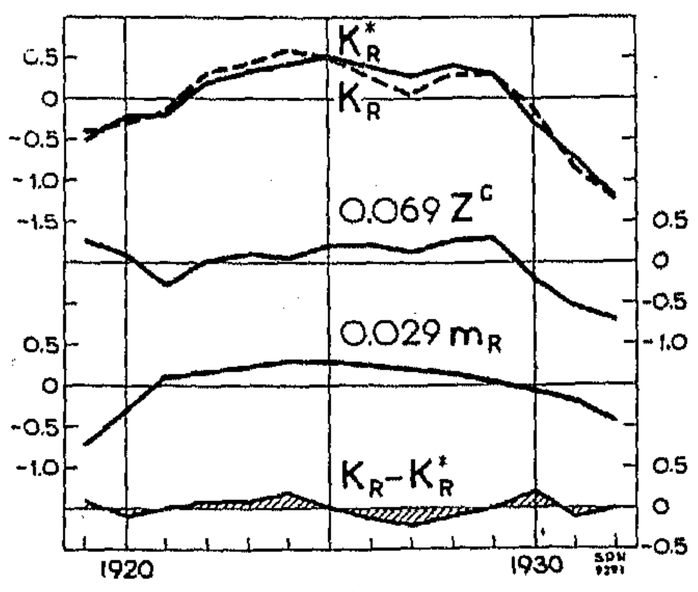
$$K_I = 0.020\,(\int Z^c_{-1} + \int Z^c_{-2}) + 0.11t \qquad (5.4).$$

A trend has been added in order to account for secular changes, and for the purely mathematical reason that $\int Z^c$ is a sum of deviations, which differs from a simple sum by a trend term.

Graph 5.4.
"Explanation" of Fluctuations in Interest Payments.



Graph 5.5.
"Explanation" of Fluctuations in Rent Payments.



(5.5) "Explanation" of Rent Payments

Rent payments are also a minor income category, and are therefore considered only roughly. It would seem natural to assume two chief influences — viz., the general business position, most easily represented by Z^c, and the special position in the housing market, represented by m_R, rent level. The inclusion of these two factors gives a satisfactory approximation to this rather inexactly known income category. The relation found by correlation calculation is:

$$K_R = 0.069Z^c + 0.029m_R \qquad (5.5).$$

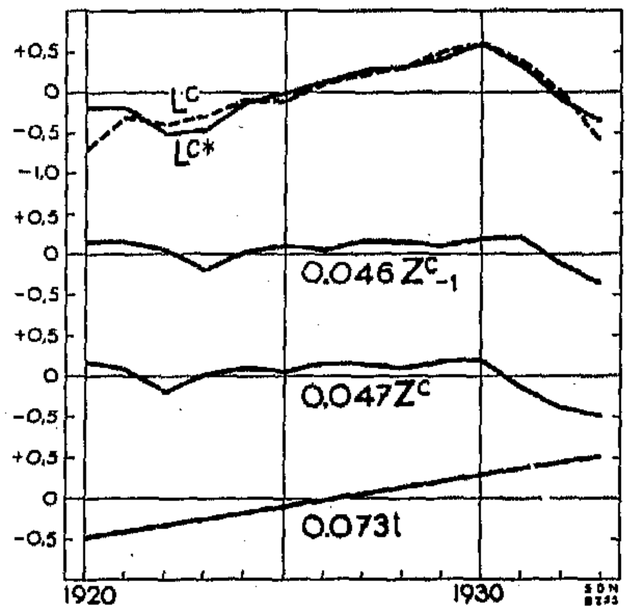
It is remarkable that no lag is found to exist in this relation.

(5.6) "Explanation" of Corporation Managers' Salaries

This category of incomes seems to depend directly on business profits, like dividends, probably with some lag. In addition, there is a structural tendency to growth in this group of incomes, which may be represented by a trend. A relation based on these assumptions was tried, and the best fit found was:

$$L_c = 0.047Z^c + 0.046Z^c_{-1} + 0.073t \qquad (5.6).$$

Graph 5.6.
"Explanation" of Fluctuations in Corporation Managers' Salaries.



(5.7) "Explanation" of Lower Salaries

The total amount of salaries could be regarded, as will be done in the case of wages, as the product of hourly salaries and the number of hours worked by all salary-earners. A further explanation ought then to be given of the number of hours and the hourly salaries. Salary-earners' employment, however, seems to be much less directly influenced by the volume of production than workers' employment; no doubt this is largely due to the "overhead" character of their work. The level of hourly salaries will depend chiefly on the profit situation and will be slow in its adaptation. Hence, instead of "explaining" employment and hourly earnings separately by about the same factors, it seemed preferable to explain the product of the two (for which, incidentally, better statistics are available) by profits with lags of 0,1 and (tentatively) 2 years, and a trend :

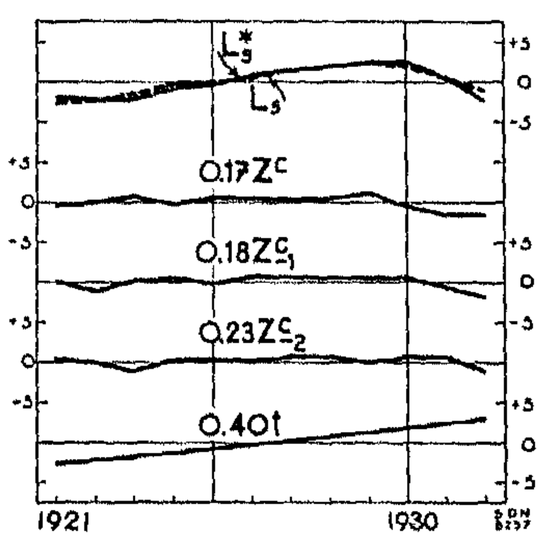
$$L_s = 0.170Z^c + 0.185Z^c_{-1} + 0.225Z^c_{-2} + 0.40t, \qquad (5.7)$$

$$L_s = 0.082Z^c + 0.368Z^c_{-1} + 0.37t \qquad (5.7').$$

The fit of (5.7) ($R = 0.990$) is somewhat, but not very much, better than that of (5.7') ($R = 0.965$).

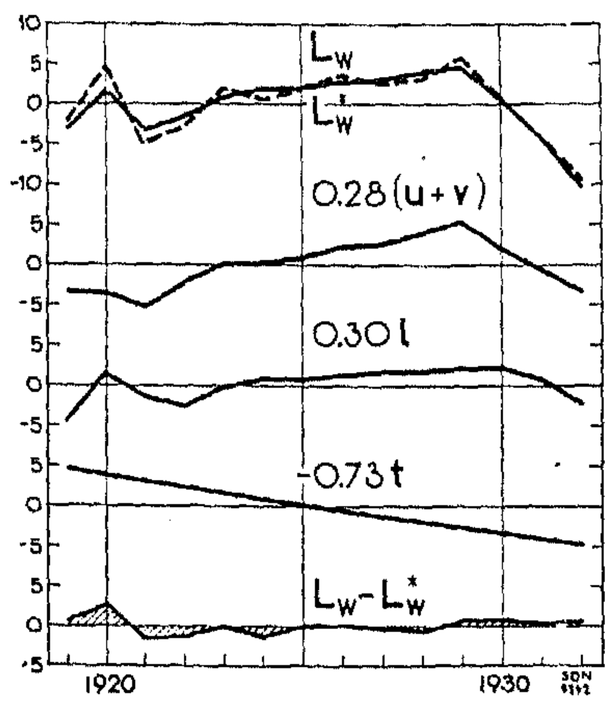
Graph 5.7

"Explanation" of Fluctuations in Lower Salaries.



Graph 5.8.

"Explanation" of Fluctuations in Wages.



(5.8) "Explanation" of Total Wages

Total wages ($\bar{L}_w + L_w$) are the product of the wage rate ($\bar{l} + l$) by employment. Employment is closely connected with the volume of production as far as the shorter fluctuations are concerned; the long-run influence of changes in technique may be approximated by a trend. (We may disregard the dependence of this secular increase on the business cycle, which, partly because there are influences in the positive as well as in the negative direction, is only slight.)

The procedure followed consists in fitting an indirect estimate of employment $\frac{(\bar{L}_w)}{\bar{l}}$ with $(u + v)$ and a trend. The linear approximation of this result runs:[1]

$$L_w = 0.28\,(u + v) + 0.30l - 0.73t \qquad (5.8).$$

(5.9) "Explanation" of Depreciation Allowances

I. *Theoretical.*

Depreciation allowances will depend first on the value of capital goods in existence. This value is the sum of net additions during each year. Net additions will, in general, be large if gross additions are large. Gross additions being equal to V, and their sum represented by $\int V$, this last variable must be included as one of the explanatory series.

If replacement were constant through time (say $\bar{V}_r$), net investment would be equal to $\bar{V} + V - \bar{V}_r$ and total capital, to the cumulation of this value; as the cumulation of a constant is a rectilinear trend series, total capital would be equal to $\int V$ + a trend. Since the average duration of life may be taken at about 24 years,[2] depreciation allowances would have to be reckoned as $0.04 \int V$ + a trend. If replacement moves parallel to V, the coefficient will be smaller than 0.04.

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[1] The result is not changed appreciably if (as, strictly speaking, should be the case) $u + v$ is replaced by $u + v + u^e - u^i$, u^e and u^i representing the volume of exports and imports respectively.

[2] Calculated from data given by Fabricant, Bulletin No. 60 of the National Bureau of Economic Research.

A second influence will be that of prices of capital goods q, especially with regard to repairs which are included in N (*cf.* graph 5.9). The influence of q would be much larger if entrepreneurs based their depreciation allowances on the principle of replacement cost — but this practice seems to be rare.[1]

A third influence will be that of the actual production [2] $u + v$. In good years, more will be charged than in bad years, when no allowances at all [3] may even be made. Thus, an equation of the following type is obtained:

$$N = N_1 \int V + N_2 t + N_3 (u + v) + N_4 q.$$

II. *Statistical.*

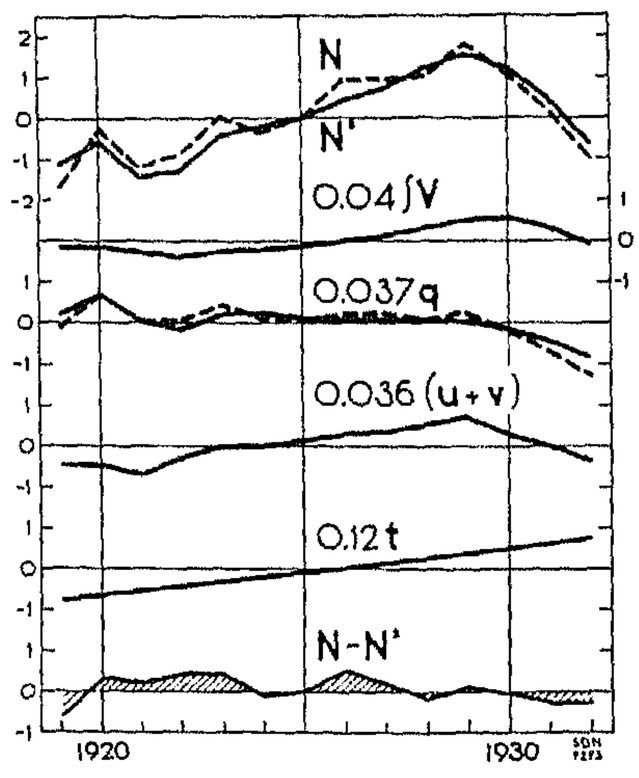
A fairly good fit is found with the following equation:

$$N = 0.04 \int V + 0.12 t + 0.036 (u + v) + 0.037 q \qquad (5.9).$$

where the coefficient 0.04 for $\int V$ is taken *a priori*; the result of the correlation calculation was slightly, but not significantly, lower.

Graph 5.9.
"Explanation" of Fluctuations in Depreciation Allowances.

(Dotted line in q: value of repairs included in N.)



[1] *Cf.* S. Fabricant, *Capital Consumption and Adjustment*, National Bureau of Economic Research, New York 1938, page 73.

[2] As a consequence of the "service-output method", as Fabricant calls it (*op. cit.*).

[3] Writings-off of capital losses are not included in the variable N. This is correct, since Z, at least for its principal purpose of explaining investment activity, should not take account of them either. There might be some influence of these writings-off on dividends, but no indication is found of its being important.

(5.10) "Explanation" of Profit Fluctuations

Profits play a central rôle in a society which is chiefly based on free enterprise. They will in many respects influence and determine the attitude of the entrepreneurs, and hence, indirectly, business activity and many other economic phenomena. It follows that, for our purpose (the explanation of real events), the definition of profits — which from the theoretical point of view is so ambiguous — has to be adapted as much as possible to the standpoint of entrepreneurs themselves, whether or not this yields a definition which is satisfactory from any normative standpoint. The equation "explaining"[1] profits should therefore be a picture of the calculations which the representative entrepreneur makes in order to find his profits. For this purpose, all enterprises have been combined into two groups, viz.: (i) those producing durable capital goods and their raw materials and semi-finished intermediate goods, and (ii) those producing other goods and services. For both groups, profits are the difference between receipts and total deductions; total profits are the sum of the two group figures.[2]

Receipts are assumed to consist of the value of goods and services sold, since such items as inter-business payments of interest, rents and dividends cancel out for all industries together. Sales are composed of home sales and exports. For the two groups, their sum will be equal to $U + V + U^e$.[3]

Deductions are assumed to consist of :

Total wages and salaries $(L_w + L_s)$
Managers' salaries (L_c)

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[1] In a sense, this equation could be called a definition equation, which would belong rather to Chapter I. But it is of course indifferent in which chapter each equation is discussed.

[2] A separate treatment for the two groups of enterprises seems hardly necessary. First, there is a striking parallelism between the two profit series, even after 1932; and, secondly, this separate treatment would be useful only if investment figures for these two groups separately were also known, which is not the case.

[3] One might perhaps have expected U' (home sales) instead of U (production for home market) in this formula. But when, *e.g.*, sales are lower than production, investment in stocks takes place, and the wages paid should therefore not be counted as costs for current sales. As we take in (5.10) all wages paid as costs, we must also take total production and not total sales.

Net rents	(K_R)
Net interest	(K_I)
Depreciation allowances	(N)
Imports	(U^i)

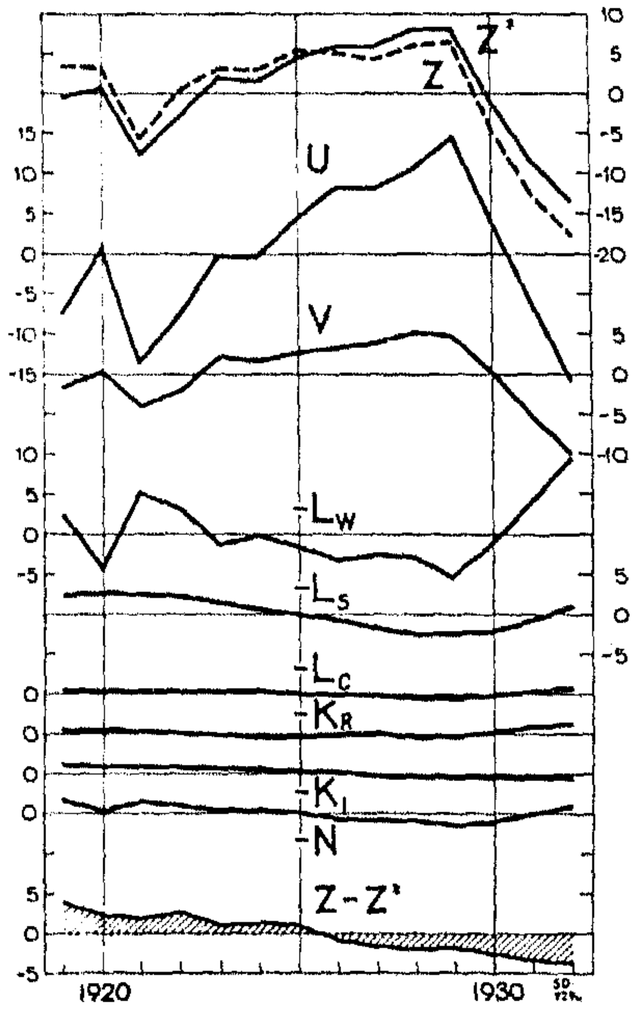
Raw-material costs other than for imported raw materials, and home sales of unfinished goods are not to be included, as they cancel out within the national economy. On the other hand, all imports are to be considered as raw materials, since retail trade, etc., is included in our groups and virtually nothing will be imported directly by the ultimate consumer.

Thus, the following relation is found:

$$Z = U+V+U^e-U^i-(L_w+L_s+L_c+K_R+K_I+N) \quad (5.10).$$

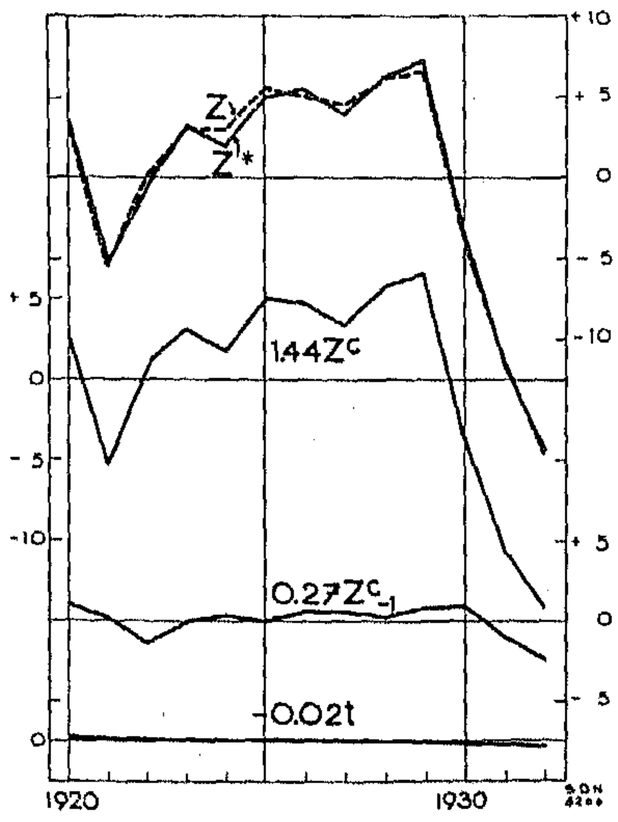
Graph 5.10.

"Explanation" of Fluctuations in Profits.



Graph 5.11.

Relation between Fluctuations in Total Profits and in Corporation Profits.



As all coefficients in this relation have values that are *a priori* equal to 1, statistical testing is extremely simple. It consists only in confronting calculated values of Z with actual ones. This has been done in graph 5.10, from which it will be seen that the chief difference is a trend difference.[1] In addition, there is a difference of nearly 5 milliard dollars in average level for which no explanation has yet been found; it must probably be ascribed to inexactitudes in average levels of other items. For the purpose of this study, this is of no importance, and the test can therefore be said to be favourable.

(5.11) "Explanation" of the Relation between Total Profits and Corporation Profits

The profit series used as an explanatory variable has always been corporation profits; sometimes because they actually are the influencing factor; at other times because they are more accurately known than general profits and are probably a good indication of them. This latter fact has been tested in relation (5.11) where it is actually found that the two variables move very nearly parallel, but with a difference in (absolute) [2] amplitude, a small lag of general profits behind corporation profits, and a trend difference, representing the growth of the corporation form of enterprise. The relation runs:

$$Z = 1.45\,Z^c + 0.26\,Z^c_{-1} - 0.02t. \qquad (5.11).$$

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[1] The difference $U^e - U^t$, being very small, has been neglected.

[2] The percentage fluctuations of corporation profits are about twice as large as those of all profits.