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STUDIES IN THE STABILITY OF INPUT-OUTPUT RELATIONSHIPS

PRICE CHANGES AS CAUSES OF VARIATIONS IN
INPUT-OUTPUT COEFFICIENTS

By

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I. The problem

Analysis of input-output relations in Norwegian production sectors over the period 1949-1960[1] have revealed rather extensive variations in input- output coefficients (i.e. the ratios between volumes of inputs and volumes of output). Analysis of the same data[2] has also made it clear that part of the variations in coefficients are of a type which can be described by trends in the coefficients over the observation period. This analysis has also shown that variations in the volume of output contribute little to explaining variations in input-output ratios. In other words, the model of proportionate changes in inputs and outputs has not been rejected. The data for 1949-1960 also made it possible to investigate whether there were groups of inputs in particular sectors, which tended to form "substitution rings" i.e. to have coefficient movements which were highly correlated.[3] This was not found to be the case in any remarkable extent, and thus this simple form of substitution was rejected as a major source of coefficient variation in the data at hand. If we now survey the remaining possible sources of coefficient variation, we may make up the following list:

1) Substitutions of a somewhat more complicated form than those referred to above, mainly to be described as a reversible change in input proportions in order to produce a product of given specifications in the cheapest possible way.

2) Reversible and irreversible changes in product mix in order to obtain an optimal combination of inputs and outputs in response to given market conditions.

3) Irreversible, but sporadic (non-smooth) changes in production techniques.

1) See Per Sevaldson: The stability of input-output coefficients in: Ed.s. A.P. Carter and A. Brody: Applications of input-Output Analysis, Amsterdam, London 1970. Also as Artikler fra Statistisk Sentralbyrå (Articles from the Central Bureau of Statistics) No. 32, Oslo 1969.

2) Ibid. and Per Sevaldson: Studies in the Stability of Input-Output Relationships. The Form of Input-Output Relationships. Working Paper from the Central Bureau of Statistics of Norway IO 73/26. Mimeographed, Oslo 1973.

3) Per Sevaldson: Substitution and Complementarity Effects on Input-Output Ratios. Working Papers from the Central Bureau of Statistics of Norway IO 69/14. Mimeographed, Oslo 1969.

4) Random changes in the distribution of the products from a sector on producing establishments with different production techniques, e.g. due to differences in fixed capital structure, size, market position, location etc.

In the present study we shall search for evidence about the first of these sources of coefficient change. In order to do that we will have to specify the possible hypotheses that may be investigated under this heading, and what are the precise implications of these hypotheses.

Hypothesis 1.a. A production sector, or the establishments which make it up, has available a number of alternative vectors of input-output proportions, i.e. proportions between quantities of each type of input and quantity of total output. Among these vectors the sector will in any one year choose the one which, at the average prices of that year, gives the cheapest sum of costs for intermediate inputs, ignoring the costs of primary inputs and possible other costs. The reasons for ignoring the costs of the primary inputs and other costs may for instance be, that these are determined by the fixed capital structure of the sector, and by the level of demand for the product, and are independent of the vector of intermediate inputs chosen.

Hypothesis 1.b. A production sector (or the establishments of which it is made up) has available to it a number of alternative vectors of input-output proportions. Among these vectors the sector will in any one year choose the one which, at the average prices of that year, gives the cheapest sum of costs for intermediate input and wages and salaries, ignoring the costs of other primary inputs than hired labour and other possible costs. The reasons for this form of the hypothesis may be that the use of hired labour may be conditioned by the choice of intermediate input proportions or vice versa, whereas the costs for other primary inputs, fixed capital and self employed labour as well as other costs are not dependent on the choice of the vector of labour and intermediate inputs.

Other hypotheses: There are, of course, other possibilities of substitution: The vector of input proportions of which the cost is minimized may include more of the primary inputs, e.g. depreciation charges, costs of employing family labour (without direct pay), computed cost of owner participation etc. Besides, there may be special costs associated with the use of particular input proportion vectors. Finally, there is the possibility, classified under point 2 above, that changes in input proportions

are linked to changes in output specifications, which may imply alternative output prices. We shall not test such hypotheses here.

As a further specification of the hypotheses to be tested we pose:

<u>Hypothesis 2.a.</u> Among the vectors of input-output coefficients available for a sector in a given year are all the vectors, which were actually realized in the sector in a given number of previous years.

<u>Hypothesis 2.b.</u> Among the vectors of input-output coefficients available for a sector in a given year are all the vectors, which were actually realized in the sector in a given number of previous and succeeding years.

II. Data

We have two sets of data which permit some testing of the above hypotheses:

A.   Norwegian national accounts for the period 1949-1960 give each year production and use of intermediate inputs in each of 79 production sectors in constant purchasers' values at 1955-prices. This means that we for each sector can compute total value of intermediate inputs as percentages of output in 1955 years' purchasers' prices for each of the years 1949-1960. If we for each sector substract from the recorded values of production the inputs from the sector Trade, we obtain production value at constant producers' prices, and we can thus compute total value of inputs (excluding the trade and transportation margins on deliveries out of the sector) as percentages of production values at constant producers' prices in each sector. Assuming that the producers in a sector are adjusting to the relationship between what they receive in payment for their products and what they pay for the inputs they use, the latter percentages should be the relevant ones in comparisons of the costs of alternative input vectors.

The national accounts also gives number of employed wage and salary earners in each sector in each year, and wages and salaries in each sector in 1955. If we assume no change in quality, we can consequently compute wage and salary costs in 1955-prices in each year in each sector, and relate these costs to production in 1955-producers' prices.

These data give us the possibility to test the chosen hypotheses
for the year 1955 with up to 6 preceding and up to 5 succeeding years.
In order to test the hypotheses for other years, we should have to con-
vert the data to the prices of these years, a procedure for which we
did not have the resources.

B.   The Central Bureau of Statistics of Norway has published input-
output data in 1964 years' producers' prices for the years 1954, 1959
and 1964[1]. These data contain the same kind of information for 113
production sectors for the years covered as the data described under A
contains for 1949-1960. Consequently they make possible a comparison of
the cost of parts of the input vector used in 1964 with the cost of cor-
responding vectors used in 1959 and 1964, all evaluated in 1964 prices.

III.   Results for the input vector 1955 compared to vectors from periods
        between 1949 and 1960.

Hypothesis 1.a. and 2.a. and b.

        Sums of intermediate inputs (including imports) in 1955 purchasers'
prices in per cent of production in 1955 producers' prices for each sector
in each year 1949-1960 are given in appendix table I, and we can perform
our tests by comparing the percentages for other years with the one for
1955 for each sector. One way to test is to rank the percentages for the
years under consideration from the lowest to the highest and compare the
average rankings for the years. If there are no systematic changes, we
would expect all years to score roughly the same average. If there is a
systematic tendency to introduce new, input saving, techniques, we would
expect the average rankings to decrease from year to year. If there is
a systematic tendency to choose the cheapest available technique, the
average ranking for 1955 should be expected to be lower than the ranking
of other years with techniques that are assumed to be available in 1955.
However, when the years are ordered according to their average ranking
we get the following picture:

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1) "Kryssløpstall 1954, 1959 og 1964. Input-Output Data 1954, 1959
    and 1964" NOS. A 234. Central Bureau of Statistics of Norway,
    Oslo 1968.

Table 1.   Average ranking of 79 coefficient sums
for each year, intermediate inputs[1]):

1951	5.65
1952	5.85
1953	6.04
1957	6.14
1959	6.56
1954	6.60
1956	6.62
1950	6.65
1958	6.68
1949	6.79
1960	7.08
1955	7.37

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1) The year with the lowest percentage for a given sector
is given the ranking 1 for that sector. The year with
the highest percentage is given the ranking 12. Equal
figures are given the average ranking, e.g. if the two
lowest figures are equal, the ranking is $1\frac{1}{2}$.

The average of these averages is 6.502 and their standard deviation is
.48[1]). The average for 1955 is the highest of all and 1.8 times the
standard deviation above the average. A deviation of at least this size
might be expected in about 7 per cent of random drawings from a normal
distribution. Thus, the higher average ranking for 1955 than for all
other years may be accidental, but there is certainly no indication of
a lower ranking for 1955 than for the other years.

We must now try to find out if this general impression is con-
firmed by a further study of the figures: Let us first look at the whole
period 1949- 1960.

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1) There is a very weak positive trend in the figures, but the regression
coefficient with time is only .05 and not statistically significant
under the usual hypotheses.

The number of coefficient sums which are lower than the coefficient sum for 1955 is given for each year in table 2.

Table 2. Number out of 79 sectors in each year 1949-1960 for which the coefficient sum for intermediate inputs is lower than the corresponding sum for 1955

Year	Number of sectors	Per cent of total
1949	39	49.4
1950	45	57.0
1951	47	59.5
1952	51	64.6
1953	49	62.0
1954	49	62.0
Total, prior to 1955 .	280	59.1
1956	50	63.3
1957	46	58.3
1958	39	49.4
1959	41	51.9
1960	37	46.8
Total, after 1955	213	53.9
Total 1949-1960	493	56.7

The number of sectors with lower coefficients than in 1955 is slightly more than half of the total in 5 of the 6 years before 1955 and 3 of the 5 years after 1955. Assuming equal probability for sums over and under the 1955-figure in each sector in each year, three of the years before 1955 and one of the years after have figures slightly more than two times the standard deviation over the expected value of one half of the 79 sectors, $39\frac{1}{2}$[1].

For the period prior to 1955 taken together the number of "sector-years" with lower coefficient sums than 1955 is 280, which is roughly four times the standard deviation over an expected value of 237 and for the period after 1955 the actual figure is 1.6 times the standard deviation above the expected value.

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1) With 79 sectors the expected value in each year is 39.5 and the standard deviation $\sqrt{0.5 \cdot 0.5 \cdot 79}$ = 4.441.

For the entire period of 11 years the actual figure is again four times the standard deviation above the expected value. There is evidently no tendency for the input combination actually used in 1955 to be cheaper than those employed in other years in the period 1949-1960.

Table 3 gives the distribution of the 79 sectors according to the numbers of years with input combinations cheaper than the one actually used in 1955 for periods of varying lengths.

Table 3. 79 production sectors distributed according to the number of years in which coefficient sums for intermediate inputs in 1955-prices were lower than in 1955.

Number of years with lower coefficient sum than 1955	Total period 1949-1954, 1956-1960	Period investigated						
		6 years before. 1949-1954	5 years after. 1956-1960	4 years before. 1951-1954	2 years before. 1953-1954	2 nearest years. 1954, 1956	4 nearest years. 1953-1957	6 nearest years. 1952-1958
11	6							
10	4							
9	6							
8	10							
7	13							
6	11	19						13
5	8	11	21					13
4	10	12	10	25			18	18
3	4	13	13	18			25	14
2	2	8	7	16	38	34	17	11
1	1	8	15	11	22	31	13	5
0	4	8	13	9	19	14	6	5
Total	79	79	79	79	79	79	79	79

For all the periods covered in the table the tendency for the 1955 figure to be the highest or above average more often than the lowest or below average is evident.

Table 4a. Distance in years from 1955 to years with lower coefficient sums for intermediate inputs.

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	65	49	50
2	8	11	12
3	1	5	-
4	1	5	4
5	-	1	-
6	-	-	.
No smaller observation	4	8	13
Total	79	79	79

Table 4a gives the distances in years from 1955 to the nearest preceding and succeeding years with lower coefficient sums for intermediate inputs in 1955-prices. For 49 sectors the coefficient sum in 1954 was lower than in 1955 when both are computed in 1955-prices, and for 60 sectors, or 3/4 of the total number, the coefficient sum was lower than in 1955 in at least one of the two immediately preceding years, 1953 and 1954. If we consider years both before and after 1955, there were 73 of the 79 sectors which had lower coefficient sums not more than two years away from 1955.

If we disregard small differences (tables 4b, c) the distance in years to the nearest lower coefficient sum increases, and the number of sectors with no coefficient sum in other years smaller than in 1955 by more than the stipulated minimum difference increases. But the number of sectors with smaller coefficient sums in years near to 1955 remains quite high, irrespective of what period we consider, both of sectors with coefficient sums 1 and 2 percentage points lower than in 1955. When we consider the 55 sectors which had coefficient sums of at least as much as 25 per cent in 1955, we also find that as many as 30 of these had coefficient sums more than 5 percentage points lower than in 1955 in at least one year of the entire period. 23 had sums so much lower in at least one of the years before 1955 and 16 in at least one of the years after 1955 (table 4d).

Table 4b. Distance in years from 1955 to years with at least 1 percentage point lower coefficient sums for intermediate inputs

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	49	35	32
2	7	11	11
3	6	6	4
4	4	6	5
5	2	2	1
6	-	1	.
No 1 per cent smaller observation	11	18	26
Total	79	79	79

Table 4c. Distance in years from 1955 to years with at least 2 percentage points lower coefficient sum for intermediate inputs

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	27	17	18
2	16	11	15
3	6	9	2
4	7	9	6
5	1	3	-
6	2	2	.
No 2 per cent smaller observation	20	28	38
Total	79	79	79

Table 4d. Distance in years from 1955 to years with at least 5 percentage points lower coefficient sum for intermediate inputs
Sectors with coefficient sum 25 per cent and above in 1955

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	9	5	6
2	5	3	2
3	6	6	3
4	6	6	3
5	3	2	2
6	1	1	.
No 5 per cent smaller observation	25	32	39
Total	55	55	55

In table 5 we have distributed the sectors according to the size of the average coefficient sum for the entire period 1949-1960 and according to the distance in years from 1955 to the nearest year with at least 1 per cent lower coefficient sum. Since the larger coefficient sums are more important for total production costs, one would expect a finer adjustment for sectors with large coefficient sums. However, irrespective of the period we consider, big coefficients show rather less tendendcy to be smaller in 1955 compared with other years than smaller coefficients.

Finally, in table 6, we have compared the 1955 coefficient sums with the averages of coefficient sums over the whole period 1949-1960 and over the period 1949-1955. More than 60 per cent of the coefficient sums in 1955 are above the averages for both periods. For the total period only 5, and for the period 1949-1955 8 coefficient sums are more than two times the standard deviation for the period concerned, lower than the average for that period. This is 6 and 10 per cent of all. Thus, there appears to be a tendency for the coefficient sum in 1955 to be higher, rather than lower than in other years. This might be explained if there was a tendency to increasing trends in the

Table 5. Distance in years from 1955 to years with at least 1 per cent
lower coefficient sums for intermediate deliveries. Distri-
bution by size of average coefficient sum 1949-1960.

Number of years	Sectors by size of average coefficient sum			
	Less than 25%	25-49.9%	50-66.6%	Over 66.6%
a. All years				
1	9	17	13	10
2	2	2	2	1
3	3	1	1	1
4	1	1	1	1
5	2	-	--	-
No smaller observation	6	2	2	1
Total	23	23	19	14
b. Years before 1955				
1	9	13	7	6
2	-	3	5	3
3	1	2	2	1
4	1	1	2	2
5	1	-	1	-
6	1	--	-	-
No smaller observation	10	4	2	2
Total	23	23	19	14
c. Years after 1955				
1	5	9	11	7
2	4	4	3	-
3	2	1	-	1
4	1	2	1	1
5	1	-	-	-
No smaller observation	10	7	4	5
Total	23	23	19	14

Table 6. 1955 coefficient sum for intermediate inputs compared to
average coefficient sum

	Number of sectors for comparison over the period	
	1949-1960	1949-1955
1955 coefficient sum equals or exceeds average	49	51
1955 coefficient less than average but exceeding average minus standard deviation for period	25	20
1955 coefficient less than average minus 1 times standard deviation, but exceeding average minus 2 times standard deviation for period ...	4	8
1955 coefficient less than average minus 3 times standard deviation, but exceeding average minus 4 times standard deviation for period ...	1	-
Total	79	79

coefficient sums. We have not computed trends in the coefficient sums. But if we compare the averages over the period 1949-1955 with the averages for the whole period 1949-1960, the tendency to positive trends would cause the averages for the whole period to exceed the averages for the earlier 7 years. However, only for 40 sectors were this the case, and we must conclude that there is no predominant tendency to increasing trends.

The conclusion concerning hypothesis 1.a. must be that in combination both with 2.a. and with 2.b. it is not confirmed. Either the coefficient vector of recent years, previous or succeeding are not available to a sector in a given year, or there are other considerations than minimization of unit input costs for intermediate inputs for the sector as a whole which determine the choice of input structure. However, we must also take into account the possibility of systematic errors in our figures. The tendency to systematically higher input costs for the 1955 input vectors than for the vector of other years computed in 1955 year prices may indicate a tendency to underestimate price increases from the period before 1955 and to overestimate price increases after 1955. Since many of the basic price observations used in the deflation procedure are unit values and since we also must count on a general improvement in qualities over the observation period, there is considerable

support for a hypothesis of general overestimation of price increases, but it is not easy to see why price increases prior to 1955 should be underestimated.

Another possibility is that hypothesis l.b. is a better approximation to reality than l.a., and that an increase in the relative cost of labour has been the cause of labour saving changes in the input structure of the production sectors, and these changes need not necessarily imply reductions in the costs for intermediate inputs.

Hypothesis l.b. and 2.a. and b.

Intermediate inputs (including imports) plus wage and salary payments all in 1955 purchasers' prices in per cent of production in 1955 producers' prices for each sector in each year 1949-1960 are given in appendix table II. As when we looked at only intermediate input sums, we can perform our tests by comparing the percentages for other years with the ones for 1955 for each sector.

If we now compare the average ranking for the twelve years, we find that there is a strong negative trend:

Table 7. Average ranking of 79 coefficient sums of intermediate and wage and slary inputs for each year[1]

Year	Observation	Trend value[2]	Deviation
1949	8.31	8.07	.24
1950	7.97	7.97	.18
1951	7.11	7.50	-.39
1952	7.15	7.21	-.06
1953	6.75	6.93	-.18
1954	6.48	6.64	-.16
1955	6.82	6.36	.46
1956	5.73	6.07	-.34
1957	5.82	5.79	.03
1958	5.99	5.50	.49
1959	5.05	5.21	-.16
1960	4.83	4.93	-.10

Footnotes to table 7, see next page.

The falling trend reflects a falling coefficient of labour
input over the period, i.e. increasing labour productivity in the pro-
duction sectors. This again may be explained by improved production
techniques, improved quality of labour, substitution of capital for
labour, but apparently not by substitution of intermediate inputs for
labour.

The observations are grouped relatively closely around the trend
and the deviation for 1955 is not more than 1.5 times the standard devia-
tion about the trend. Still, the average ranking of the coefficient
sums for 1955 is higher than the averages for the two preceding years,
and whereas the average for 1955 is relatively far out above the trend,
the figure for 1956 is relatively far below. The figures give thus no
indication that the production techniques of prior years or of later
years are available as alternatives in a given year and are applied
when they give lower sums of intermediate and labour input costs than
other alternatives.

When there is a strong technological trend in the sector, there
is a continous change in the input vector, and we must believe that the
sum coefficient for each year is determined by the technological develop-
ment. It might therefore be of interest to study the average ranking
for sectors, which do not show a strong trend in the sum coefficient.
As a rough criterion for the existence of a trend we used the following:
A sector is considered to have a negative trend in the coefficient sum
if

a) One of the three first years (1949-1951) has the highest or second
highest ranking.

b) One of the three last years (1958-1960) has the lowest or second
lowest ranking.

c) None of the three first years has a lower ranking than 7 ($6\frac{1}{2}$).

d) None of the three last years has a higher ranking than 6 ($6\frac{1}{2}$).

The criteria for a positive trend were defined correspondingly.
By these criteria 24 sectors were classified as having a negative trend
and 7 as having a positive trend. There was thus left 48 sectors, which
were not classified as having a trend.

To page 14: 1) The year with the lowest percentage for a given sector
is given the ranking 1 for that sector. The year with
the highest percentage is given the ranking 12. Equal
figures are given the average rank of nearest higher
and lower ranks.

2) A linear trend was fitted by ordinary least squares.

The classification prosedure is of course rather rough and inaccurate, but very simple to apply. Probably more refined methods would give higher numbers of sectors with trend. For the 48 sectors classified as having no trend the average rankings came out as in table 8.

Table 8. Average ranking of 48 coefficient sums of intermediate and wage and salary inputs to sectors without trend for each year[1])

1949	7.56
1950	7.28
1951	6.46
1952	6.88
1953	6.25
1954	6.22
1955	6.96
1956	5.86
1957	6.29
1958	6.77
1959	5.69
1960	5.76

1) Lowest percentage = 1, highest = 12. Equal figures are given the average rank of nearest higher and lower ranks.

While the two first years still get rankings considerably above and the two last considerably below the average, the figures for the eight remaining years are scattered about the expected average of $6\frac{1}{2}$ in an apparently unsystematic way, abd the average for 1955 is higher than the 7 others. Thus, also these figures indicate that there is no tendency for the coefficient sum in 1955 in 1955-prices to be lower than the corresponding sum in 1955-prices for other years, even when the cost of hired labour is included with intermediate inputs in the sum coefficient.

We must again find out if a closer study of the figures will modify the general impression.

We see from table 9, that in spite of the general tendency to a decreasing sum coefficient when the cost of labour is included, there is a considerable number of sectors in each of the years prior to 1955, which have lower

Table 9. Numbers of sectors for which the sum of coefficients for
intermediate and wage and salary input is lower than the
corresponding sum in 1955

Year	Number of sectors	Per cent of total
1949	25	31.7
1950	29	36.8
1951	37	46.9
1952	30	38.0
1953	35	44.3
1954	43	54.5
Total, prior to 1955	199	42.0
1956	53	67.1
1957	49	62.0
1958	46	58.2
1959	53	67.1
1960	55	69.6
Total, after 1955	256	65.0
Total 1949-1960	455	52.4

coefficient sums for that particular year than they had in 1955. In
fact, as many as 42 per cent of the sector-years in the period 1949-
1954 give lower sums than the corresponding sums in 1955. Conversely,
there is still a considerable number of sectors which had higher coeffi-
cient sums computed in 1955-prices after 1955 than in 1955. The percen-
tage of sector-years with lower coefficient sums was not higher than
65.

In table 10a we have counted the number of years with coeffi-
cient sums lower than in 1955 for each sector over periods of varying
length. Due to the existence of trends in a relatively great number
of sectors, this table gives a more varied picture than the corres-
ponding table 3, where labour costs were not included in the coeffici-
ent sums. For periods prior to 1955, there is a tendency for the
1955-figure to be lower than the average, in particular where the longer
periods of 6 and 5 years are considered. When we include years after
1955, we see a tendency for the 1955-figure to be the highest.

In table 10b we have only included the 48 sectors which are
classified as having no trend in the coefficient sum. For these sectors

Table 10a. 79 production sectors distributed according to the number of years in which coefficient sums for intermediate inputs plus wages and salaries in 1955-prices were lower than in 1955

Number of years with lower coefficient sum than 1955	Period investigated							
	Total period 1949-1954, 1956-1960	6 years before. 1949-1954	5 years after. 1956-1960	4 years before. 1951-1954	2 years before. 1953-1954	2 Nearest years. 1954-1956	4 nearest years. 1953-1957	6 nearest years. 1952-1958
11	1							
10	7							
9	8							
8	7							
7	9							
6	12	8						9
5	9	7	31					14
4	8	12	13	15			17	10
3	8	11	9	12			17	19
2	2	10	6	16	29	28	23	14
1	6	15	10	17	20	40	14	7
0	2	16	10	19	30	11	8	6
Total	79	79	79	79	79	79	79	79

there is apparently no tendency for the coefficient sum to be lower in 1955 than in preceding years.

Table 11a gives distances in years from 1955 to the nearest preceding and succeeding years with lower coefficient sums for intermediate and wage and salary inputs in 1955-prices. For 43 sectors the coefficient sum in 1954 was lower than in 1955, and for 49 sectors the coefficient sum was lower than in 1955 in at least one of the two immediately preceding years, 1953 and 1954. This is slightly less than the corresponding number obtained when only the coefficient sum for intermediate inputs is considered (60 sectors according to table 4a.), but it is still 62 per cent of the 79 sectors. If we consider years both before and after 1955, there were 71 of the sectors which had lower coefficient sums not more than two years away from 1955.

Table 10b. 48 production sectors without trend distributed according to the number of years in which coefficient sums for intermediate inputs plus wages and salaries in 1955-prices were lower than in 1955

Number of years with lower coefficient sum than 1955	Period investigated							
	Total period 1949-1954, 1956-1960	6 years before. 1949-1954	5 years after. 1956-1960	4 years before. 1951-1954	2 years before. 1953-1954	2 nearest years. 1954, 1956	4 nearest years. 1953-1957	6 nearest years. 1952-1958
11	1							
10	7							
9	5							
8	5							
7	5							
6	6	5						7
5	1	5	14					11
4	4	9	9	10			14	2
3	7	9	7	10			7	9
2	-	8	4	11	21	17	12	10
1	6	9	6	11	12	25	10	5
0	1	3	8	6	15	6	5	4
Total	48	48	48	48	48	48	48	48

If we again restrict the analysis to the 48 sectors classified as having no trends in the sum coefficient, we find a distribution which is quite similar to the one we obtained when wage and salary costs were not included in the coefficient sum (table 11b).

Disregarding small differences (tables 11 c and d) has comparable effects to what it had when we studied coefficient sums for intermediate inputs only (compare tables 4a - c). 76 sectors had coefficient sums of intermediate and wage and labour input of at least 25 per cent in 1955, 44 or 58 per cent of these had a coefficient sum 5 percentage points lower than in 1955 in at least one year in the entire period. 18 had sums so much lower in at least one of the years before 1955 and 37 in at least one year after 1955. When only 18

Table 11a. Distance in years from 1955 to years with lower coefficient sums for intermediate and wage and salary inputs

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	68	43	53
2	3	6	6
3	1	4	2
4	3	7	5
5	1	1	3
6	1	2	.
No smaller observation	2	16	10
Total	79	79	79

Table 11b. Distance in years from 1955 to years with lower coefficient sums. Percentage distributions

Number of years	Percentage of sectors with given distance to nearest year with lower sum								
	Intermediate and wage and salary inputs						Intermediate inputs only		
	All 79 sectors			48 sectors without trend			All 79 sectors		
	All years	Preceding years	Successive years	All years	Preceding years	Successive years	All years	Preceding years	Successive years
1	86.0	54.5	67.1	87.4	60.4	64.6	82.2	62.0	63.3
2	3.8	7.6	7.6	2.1	8.3	6.2	10.1	13.9	15.2
3	1.3	5.1	2.5	2.1	6.2	4.2	1.3	6.3	-
4	3.8	8.8	6.3	2.1	12.5	6.2	1.3	6.3	5.1
5	1.3	1.3	3.8	2.1	2.1	4.2	-	1.3	-
6	1.3	2.5	.	2.1	4.2	.	-	-	.
No smaller observations	2.5	20.2	12.7	2.1	6.3	14.6	5.1	10.2	16.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 11c. Distance in years from 1955 to years with at least 1 percentage point lower coefficient sums for intermediate and wage and salary inputs

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	55	28	42
2	8	11	9
3	1	2	3
4	7	11	7
5	1	2	2
6	-	1	.
No 1 per cent smaller observation	7	24	16
Total	79	79	79

Table 11d. Distance in years from 1955 to years with at least 2 percentage points lower coefficient sum for intermediate and wage and salary inputs

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	38	15	30
2	11	8	12
3	4	1	4
4	6	10	7
5	4	2	4
6	-	-	.
No 2 per cent smaller observation	16	43	22
Total	79	79	79

Table 11e. Distance in years from 1955 to years with at least 5 per-
centage points lower coefficient sum for intermediate and
wage and salary inputs. Sectors with coefficients sums of
25 per cent or more in 1955

Number of years	Number of sectors with given distance to nearest of		
	All years	Preceding years	Successive years
1	16	6	12
2	5	2	4
3	7	4	7
4	9	5	7
5	7	-	7
6	-	1	.
No 5 per cent smaller ob- servation	32	58	39
Total	76	76	76

of the 76 sectors had a coefficient sum at least 5 per cent lower than
in 1955 in at least one of the preceding years, this has to do with the
occurence of trends in the sum in so many of the sectors. Among the 47
sectors without trend and with coefficient sum at least 25 in 1955, 15
had a sum at least 5 per cent lower than in 1955 in at least one of the
preceding years, whereas the figure was only 3 out of a total of 29
sectors with trend.

In table 12 we have distributed the sectors according to the
size of the average sum coefficient for intermediate and wage and salary
inputs over the period 1949-1960, and according to the distance in
years from 1955 to the nearest year with at least 1 per cent lower coef-
ficient sum. As when we considered intermediate input alone, there is
no indication of a tendency to find the smallest coefficient sum in 1955
for the sectors with high input sums more often than for those with
low.

In table 13 the coefficient sums for 1955 are compared with
the average coefficient for each sector over the whole period 1949-
1960 and over the period 1949-1955. Nearly 50 per cent of the coeffi-
cient sums for 1955 are equal to or exceeding the corresponding aver-
age for the period 1949-1960 and nearly 40 per cent are equal to or

Table 12. Distance in years from 1955 to years with at least 1 per
cent lower coefficient sums for intermediate and wage
and salary inputs. Distribution by size of average coef-
ficient sum 1949-1960

Number of years	Sectors by size of average coefficient sum			
	Less than 50%	50-74.9%	75-89.9%	Over 90%
a. All years				
1	9	11	23	12
2	1	2	3	2
3	-	-	1	-
4	1	2	3	1
5	-	1	-	-
6	-	-	-	-
No 1 per cent smaller observation	3	2	2	-
Total	14	18	32	15
b. Years before 1955				
1	6	7	8	7
2	1	2	5	3
3	-	-	1	1
4	1	1	8	1
5	-	1	-	1
6	-	1	-	-
No 1 per cent smaller observation	6	6	10	2
Total	14	18	32	15
c. Years after 1955				
1	8	7	19	8
2	2	2	4	1
3	-	-	2	1
4	-	4	1	2
5	-	1	-	1
No 1 per cent smaller observation	4	4	6	2
Total	14	18	32	15

Table 13. 1955 coefficient sum for intermediate and wage and salary inputs compared to average coefficient sum

	Number of sectors for comparison over the period	
	1949–1960	1949–1955
1955 coefficient sum equals or exceeds average	39	31
1955 coefficient less than average but exceeding average minus standard deviation for period	33	27
1955 coefficient less than average minus 1 times standard deviation, but exceeding average minus 2 times standard deviation .	7	19
1955 coefficient less than average minus 2 times standard deviation, but exceeding average minus 3 times standard deviation .	-	2
Total	79	79

exceeding the corresponding average for the period 1949-1955. No coefficient sum in 1955 is more than two times the standard deviation below the average for the whole period, and only 2 sectors show a deviation of that magnitude below the average for the period 1949-1955. Thus, even this test cannot be said to corroborate a hypothesis that the coefficient sum for 1955 tends to be lower than the corresponding sums for other years, when these are computed in 1955-years prices.

Taken together our data do not tend to support hypothesis 1.b. in combination with either 2.a. or 2.b., that is, that the sectors in each year choose vectors of intermediate and labour inputs which are cheaper per unit of output than the vectors of preceding or of preceding and succeeding years (when these latter are computed in the prices of the year in question).

IV. Results for the input vector 1964 compared to vectors from 1954, 1959

The data for 1954, 59 and 64 in 1964-prices are much less usefull for our analysis than the series 1949-1960 in 1955-prices: For one thing we have only three years, and the years of comparison are respectively 5 and 10 years away from 1964. Besides, there is a chance that there may be greater errors in the deflation process, because the figures for

1954 and 1959 were originally computed in current and 1955-prices
and the figures for 1964 were given in current and 1961-prices. In
order to transform the 1954 and 1959 figures to 1964 prices, a recal-
culation, via the linkage year of 1961 (computed in (current) 1961-
and in 1955-prices) had to be carried out. This process could not
be done in the same detail and with the same exactitude as the origi-
nal national accounting computations. It may nevertheless be worth-
while to have a look at the 54-59-64-figures.

Hypothesis 1.a. and 2.a.

We shall investigate to what extent there was a tendency for
the sum coefficient for intermediate inputs alone in 1964 to be lower
than in the two previous observation years, 1954 and 1959, when all
coefficients are in 1964-prices. The results for the 113 sectors, in
total, and classified according to the size of the average coefficient
sum over the three years are given in tables 14a and b.

A little less than half the coefficient sums were smaller in
1959 than five years later, and two fiths were smaller in 1954 than
ten years later. One third of the sectors had higher coefficient sums
in 1964 than both 5 and 10 years earlier, when all figures are com-
puted in 1964-prices. The overall figures indicate no tendency for
the coefficient sums in 1964 to be systematically lower than the coeffi-
cient sums for either of the earlier years computed in 1964-prices.[1]

When we consider the average size of the coefficient sum, only
the sectors with the largest sums, i.e. above 75 per cent, appear to
stand off from the rest. For the 13 sectors in this group there
appears to be a stronger tendency for 1964 to have the lowest coeffi-
cient sum. But with only 13 sectors in the group, there is scope for
great random variations.

Most of the sectors increased their production from 1954 to
1964, but the changes were far from uniform. Possibly, the changes in
coefficient sums might be associated with the type of production

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1) Assuming an equal probability for the coefficient sum for any
   sector to be smaller or greater than in 1964 in each year, the
   percentage for 1959 is less than .3 times the standard devia-
   tion and that for 1954 about $1\frac{1}{2}$ times the standard deviation
   less than the expected value of 50 per cent.

Table 14a. Comparisons of coefficient sums for intermediate inputs
in 1964-prices for 113 sectors in 1954, 1959 and 1964.
Classification by size of coefficient sums in per cent
of output. Number of sectors

	Size of average coefficient sum				
	0- 24.9	25.0- 49.9	50.0- 74.9	75.0+	Total
1959-sum lower than 1964	14	19	18	4	55
1954-sum lower than 1964	11	17	18	2	48
Both 1959- and 1954-sum lower than 1964[1])	8	15	11	1	35
No sum lower than 1964	13	11	13	8	45
Total number of sectors	30	32	38	13	113

1) These figures are included in both the preceding lines.

Table 14b. Comparisons of coefficient sums for intermediate inputs in
1964-prices for 113 sectors in 1954, 1959 and 1964. Classi-
fication by size of coefficient sum in per cent of output.
Percentages of numbers of sectors

	Size of average coefficient sum				
	0- 24.9	25.0- 49.9	50.0- 74.9	75.0+	Total
1959-sum lower than 1964	46.7	59.4	47.4	30.8	48.7
1954-sum lower than 1964	36.7	53.1	47.4	15.4	42.5
Both 1959- and 1959-sum lower than 1964[1])	26.7	46.9	29.0	7.7	31.0
No sum lower than 1964	43.3	34.4	34.2	61.5	39.8
Total number of sectors	100.0	100.0	100.0	100.0	100.0

1) These figures are included in both the preceding lines.

change in the sector. In table 15 a and b we have classified the sectors
according to the percentage change in production volume from 1954 to
1965.

The results are rather similar for the various classes of change.
Only the 8 sectors, which more than tripled their production volume
over the decade, appear to generally have increased their input sums
even more. But not very strong conclusions can be drawn from this ob-
servation for only eight sectors.

In testing hypothesis 1.b. in the next section we will investigate
whether the sum coefficients of intermediate and wage and salary input used
in 1964

Table 15a. Comparisons of coefficient sums for intermediate inputs
in 1964-prices for 113 sectors in 1954, 1959 and 1964.
Classification by percentage change in sector production
1954-1964. Numbers of sectors

	Percentage change in production 1954-1964						
	More than 25% reduction	-25- +24.9	25- 49.9	50- 74.9	75- 99.9	100- 199.9	200 and over
1959-sum lower than 1964	2	16	8	9	6	8	6
1954-sum lower than 1964	3	11	7	11	5	6	5
Both 1959- and 1954- sum lower than 1964[1]	2	8	6	6	4	5	4
No sum lower than 1964	2	9	11	10	6	6	1
Total number of sectors	5	28	20	24	13	15	8

1) These figures are included in both the preceding lines.

Table 15b. Comparisons of coefficient sums for intermediate inputs in
1964-prices for 113 sectors in 1954, 1959 and 1964. Clas-
sification by percentage change in sector production 1954-
1964. Percentages of numbers of sectors

	Percentage change in production 1954-1964						
	More than 25% reduction	-25- +24.9	25- 49.9	50- 74.9	75- 99.9	100- 199.9	200 and over
1959-sum lower than 1964	40.0	57.2	45.9	45.8	47.0	48.7	75.0
1954-sum lower than 1964	60.0	39.3	40.3	40.0	40.0	42.5	62.5
Both 1959- and 1954- sum lower than 1964[1]	40.0	28.6	27.8	28.2	29.0	31.0	50.0
No sum lower than 1964	40.0	32.1	41.6	42.4	42.0	39.8	12.5
Total number of sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1) These figures are included in both the preceding lines.

tend to be lower than the corresponding sum coefficients for 1954 and

1959, when they all are computed in 1964-prices. It might, however, be of some interest first to find out if there are indications of direct substitution between intermediate inputs and labour, such that the sum coefficients for intermediate inputs have in general increased for sectors for which the labour coefficient has decreased and intermediate inputs have decreased for sectors for which the labour coefficient has increased.

In table 16 we have grouped the sectors according to the change from 1954 to 1964 in the coefficient for wage and salary input in 1964-prices.

Table 16. Comparisons of coefficients sums for intermediate inputs in 1964-prices for 113 sectors in 1954, 1959 and 1964. Classification by change in the coefficient for wage and salary input

| | Change in the coefficient of wage and salary as per cent of output | | | |
| | Increases and less than 10 percentage points decrease | | More than 10 percentage points decrease | |
	No. of sectors	Per cent	No. of sectors	Per cent
1959-sum lower than 1964.	26	42.7	29	55.8
1954-sum lower than 1964.	22	36.1	26	50.0
Both 1959- and 1954-sum lower than 1964[1)	14	23.0	21	40.4
No sum lower than 1964 ..	27	44.2	18	34.6
Total number of sectors .	61	100.0	52	100.0

1) These figures are included in both the preceding lines.

There appears to be a slight tendency for those sectors which had the largest declines in the labour input coefficient to have an increase in the coefficient sum for intermediate inputs more often than those which had a more moderate decrease or an increase in the labour input coefficient.

Hypothesis 1.b. and 2.a.

We will now compare the coefficient sums including both intermediate inputs and wage and labour inputs for the three years 1954, 1959 and 1964. Figures are given for the sectors grouped according to

Table 17a.   Comparisons of coefficient sums for intermediate and wage
and salary inputs in 1964-prices for 113 sectors in 1954,
1959 and 1964.   Classification by size of coefficient sum
in per cent of output.   Number of sectors

	Size of average coefficient sum					
	0- 49.9	50- 74.9	75- 89.9	90- 99.9	100+	Total
1959-sum lower than 1964	5	3	8	2	2	20
1954-sum lower than 1964	4	3	9	1	-	17
Both 1959- and 1954-sum lower than 1964[1)	4	2	2	-	-	8
No sum lower than 1964	6	15	31	22	10	84
Total number of sectors	11	19	46	25	12	113

1)   These figures are included in both the preceding lines.

Table 17b.   Comparisons of coefficient sums for intermediate and wage
and salary inputs in 1964-prices for 113 sectors in 1954,
1959 and 1964.   Classification by size of coefficient sum
in per cent of output.   Percentages of numbers of sectors

	Size of average coefficient sum					
	0- 49.9	50- 74.9	75- 89.9	90- 99.9	100+	Total
1959-sum lower than 1964	45.5	15.8	17.4	8.0	16.7	17.7
1954-sum lower than 1964	36.4	15.8	19.6	4.0	-	15.1
Both 1959- and 1954-sum lower than 1964[1)	36.4	10.5	4.4	-	-	7.1
No sum lower than 1964	54.5	78.9	67.4	88.0	83.3	74.3
Total number of sectors	100.0	100.0	100.0	100.0	100.0	100.0

1)   These figures are included in both the preceding lines.

the average size of the sum coefficient over the three years in table

17 a and b.   Since 72, or 64 per cent of the 113 sectors had average

sum coefficient between 75 and 99.9 per cent of output, the represen-

tation in size groups outside this range is rather thin.   The effects

of a falling trend in the labour input coefficient comes out even clea-

rer here than in the 1949-1960-data.   The coefficient sum including wages

and salaries is lowest in 1964 for three quarters of the sectors.   The

data thus do not contradict a hypothesis that there is a tendency for

the coefficient sum in 1964 to be lower than the corresponding sums for

previous years, when these are computed in 1964-prices.

Our data cannot tell us whether the tendency to a lower 1964-coefficient was the effect of non-reversible technological change, or of reversible adaptions to changes in relative prices. However, the classification by size groups in table 17 a and b, show that the tendency for the 1964 coefficient sum to be the smallest increases when the average coefficient sum increases, i.e. when the importance of other cost elements in a sector's budget are relatively smaller. This may indicate that minimum cost vectors for intermediate and labour inputs are chosen when other cost elements are of minor importance, but it may also just reflect the fact that the scope for structural decreases in labour input is greatest for sectors with a large labour input per unit of output.

In table 18 the sectors have been classified according to the change in the wage and salary coefficient over the period 1954-1964. It is clear from this table that the change in the sum coefficient for intermediate and wage and salary input is positively associated with the change in the coefficient for wage and salary input.

Table 18. Comparisons of coefficient sums for intermediate and wage and salary inputs in 1964-prices for 113 sectors in 1954, 1959 and 1964. Classification by change in the coefficient for wage and salary input

| | Change in the coefficient of wages and salaries as per cent of output | | | | | |
| | Increase and less than 5 percentage points decrease | | 5.0-19.9 percentage points decrease | | More than 20 percentage points decrease | |
	Number of sectors	Per cent	Number of sectors	Per cent	Number of sectors	Per cent
1959-sum lower than 1964	11	33.3	6	10.5	3	13.0
1954-sum lower than 1964	14	42.4	3	5.2	-	-
Both 1959- and 1954- sum lower than 1964[1]	7	21.2	1	1.7	-	-
No sum lower than 1964	15	45.5	49	86.0	20	87.0
Total number of sectors	33	100.0	57	100.0	23	100.0

1) These figures are included in both the preceding lines.

Summary and conclusions

We have in this study investigated to what extent available
data support hypotheses to the effect that changes in input-output coef-
ficients can be explained as the effects of a certain type of cost adjust-
ments in the production sectors specified in the coefficient table. The
cost adjustments considered are such as would result if the sectors for
a given year always chose the vector of input-output coefficients which,
in that year's prices, gave the lowest coefficient sum. Two alternative
concepts of coefficient sums are considered, namely the sum : of
input coefficients for intermediate inputs alone and the same sum aug-
mented by the coefficient for wages and salaries, i.e. hired labour input.
Alternative assumptions are made about the extent to which input-output
vectors realised in previous and succeeding years are available to the
sectors in a given year.

The testing of the hypotheses consists in registering the occu-
rences of lower input coefficient sums among observed input-output coef-
ficient vectors which are assumed to be available in the given year than
the coefficient sum actually realized in that year, when all coefficients
are computed in the given year's prices. Two sets of data were avail-
able: 1) Input-output coefficients for 79 sectors in the prices of the
year 1955 for each of the 12 years 1949-1960. Here assumptions of
availability in 1955 of vectors from periods of varying length up to 6
years before 1955 and up to five years after 1955 could be tested. 2)
Input-output coefficients for 113 sectors in the prices of the year 1964
for the three years 1954, 1959 and 1964. Here we could only test our
hypotheses under the assumptions that the 1954- and/or the 1959-vectors
of input-output coefficients were available in 1964.

Neither of these data sets appear to confirm a hypothesis that
the realized coefficient vector is the one which gives the lowest coef-
ficient sum of intermediate inputs alone in the given year's prices.
This conclusion is independent of the assumption made about which alter-
native realized vectors are available.

When the input coefficient for hired labour is included in the
coefficient sum, both data sets indicate a tendency for the coefficient
sum of the given year to be lower than the coefficient sums for earlier
years, when all coefficients are computed in the prices of the given
year. This result appears to be the effects of a tendency to declining
trends in the input coefficient for hired labour. The data give no

basis for deciding whether these trends are the effects of reversible
adjustments to ever rising relative prices of labour, or the effects
of (in the short run) irreversible technological changes associated
with increasing capital intensity and technological progress. The
author must admit that he subscribes to the latter explanation: It
is my belief that the observed changes (which are quite considerable)
in input-output coefficients are the effects of much more complex
causes than the simple types of substitution tested in this investi-
gation. Among such causes may be mentioned technological change,
changes in product mix, changes in product specifications, changes
in product distribution over producing establishments etc. and last
but not least, a host of possible errors in statistical reporting,
measurement and deflation. The present investigation has not weakened
my belief in these more complex explanations. However, its value is
limited, just as its scope. More evidence will be required, and the
author is prejudiced in favour of a conclusion to the effect that the
changes in coefficients may be treated as random, since such a con-
clusion appears to be less troublesome for the applicability of input-
output models than a hypothesis of simple cost minimizing coefficient
adjustments.

Appendix table I. Sum intermediate inputs in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1 Agriculture ..	22.1	22.7	22.3	24.2	23.1	25.3	31.8	30.0	28.6	29.4	30.9	35.4
2 Foresty	11.6	11.3	11.0	10.3	9.9	10.7	9.9	9.0	10.1	9.2	9.8	9.9
3 Hunting	5.7	5.7	5.7	6.1	5.2	5.1	6.5	4.7	4.0	4.0	5.6	5.9
4 Fishing	14.9	13.5	12.0	12.4	15.0	13.0	13.8	13.1	15.6	18.0	18.5	20.0
5 Whaling	34.1	27.5	25.2	23.2	22.6	20.5	24.1	22.6	21.3	18.9	19.0	25.6
6 Coal mining ..	8.1	9.4	7.4	10.5	10.5	14.2	17.2	11.5	9.4	10.9	10.2	7.2
7 Metal mining .	9.4	9.6	11.9	14.8	15.4	13.6	12.8	13.1	15.0	14.1	13.6	15.6
8 Quarrying	8.7	9.5	8.8	8.8	9.6	10.6	12.1	10.5	13.9	13.3	12.4	11.5
9 Slaughtering .	89.0	84.2	87.4	85.8	86.4	88.3	86.8	85.3	84.7	85.1	84.0	82.8
10 Dairies	128.8	122.7	124.5	123.4	125.4	129.6	128.5	125.3	126.2	120.0	119.6	12.6
11 Margarine	71.3	72.8	70.8	74.0	73.8	75.0	74.6	74.4	76.8	77.7	78.9	80.8
12 Fish canning .	65.4	65.4	66.6	61.6	62.3	65.8	64.0	69.2	62.8	63.9	69.8	75.2
13 Fish process- ing	77.9	73.3	66.8	74.4	76.9	78.0	73.0	69.4	68.0	71.4	74.2	79.4
14 Grain mills ..	94.1	94.5	93.9	93.6	93.8	93.9	92.8	92.5	91.9	89.2	92.0	92.2
15 Bakeries	50.5	47.9	48.3	47.5	48.5	49.0	47.9	46.9	48.8	50.1	49.4	51.1
16 Chocolate	44.9	36.6	33.4	36.4	36.1	37.3	39.3	37.5	36.6	36.5	35.7	35.5
17 Other food ...	64.8	63.4	57.4	61.1	62.8	62.4	63.1	73.2	65.6	70.2	75.0	73.2
18 Spirits	20.2	20.6	22.8	26.1	28.8	29.8	32.2	25.5	39.1	34.3	34.9	34.9
19 Breweries	24.4	26.5	25.0	24.0	24.3	24.2	24.3	23.4	22.4	23.6	22.4	23.0
20 Tobacco	27.4	27.2	27.5	26.1	26.2	27.2	28.4	27.5	26.3	26.4	26.4	27.6
21 Textiles	54.6	59.8	59.2	59.9	60.8	60.6	61.6	60.3	63.0	59.1	61.9	59.7

Appendix table I. (cont.) Sum intermediate inputs in 1955 purchasers' prices as percentages of output in 1955 producers' prices 1949-1960

	Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
22	Knitting mills	54.5	63.2	56.7	52.3	55.9	59.7	60.1	56.2	55.7	58.9	62.3	61.0
23	Cordage	59.6	62.1	66.7	55.1	56.7	58.0	55.1	60.7	59.3	57.7	73.2	69.4
24	Footwear	57.7	59.2	57.5	54.5	54.7	56.2	56.5	55.5	57.5	60.6	55.6	55.6
25	Apparel	60.4	56.9	54.4	58.5	60.2	59.8	56.7	57.1	56.0	56.9	53.5	55.0
26	Sawmills	72.1	69.8	70.8	71.1	68.4	68.6	69.4	74.8	73.1	71.8	73.0	69.5
27	Wood and cork.	58.1	56.1	49.3	49.5	51.9	52.2	50.1	49.8	50.0	52.2	52.6	51.0
28	Wood pulp	70.2	70.4	70.0	72.4	69.6	68.4	69.5	67.1	66.3	66.4	64.2	64.8
29	Paper	65.1	68.1	69.1	67.9	64.5	65.5	67.2	70.0	68.6	69.8	69.4	72.0
30	Wallboards ...	46.0	47.7	52.6	46.3	45.9	45.5	45.5	46.0	42.0	34.6	38.0	37.3
31	Paper products	61.2	56.0	59.4	56.7	59.9	64.3	62.4	61.2	61.1	63.5	59.4	57.7
32	Publishing ...	69.7	69.0	66.0	67.8	73.4	71.9	73.0	65.9	68.3	68.8	67.3	64.5
33	Printing	37.9	38.1	33.9	35.0	37.9	39.0	41.1	42.1	41.8	45.6	46.5	46.1
34	Leather	60.3	60.8	58.8	61.1	63.0	62.7	60.3	60.5	58.3	57.7	60.1	54.8
35	Rubber products	46.1	46.3	47.3	48.7	50.0	51.4	50.7	47.8	55.5	54.8	54.1	53.3
36	Basic chemicals	43.8	45.2	39.7	45.2	46.6	45.6	46.6	47.2	48.6	50.2	44.6	51.1
37	Other chemicals	70.5	64.3	64.6	62.5	57.6	54.9	58.0	56.8	55.4	54.8	54.0	55.6
38	Herring oil ..	116.4	107.2	90.7	84.8	79.7	79.7	82.9	76.8	79.1	78.2	87.3	82.9
39	Vegetable oil.	88.1	109.7	114.4	120.6	117.2	126.5	119.5	114.6	115.7	119.6	115.8	121.5
40	Oil refineries	102.9	88.6	95.7	89.2	85.8	84.6	85.5	87.6	89.6	92.7	93.3	96.1
41	Mineral products	42.4	45.5	44.6	43.9	42.0	41.8	44.2	42.2	40.9	41.4	43.3	42.0
42	Ferro-alloys .	78.8	70.4	59.8	68.8	65.7	68.7	66.8	56.1	63.8	62.2	57.2	55.2

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Appendix table I. (cont.) Sum intermediate inputs in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sectors	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
43	Steel works	61.2	59.2	57.6	50.0	54.4	50.4	64.1	57.5	51.8	52.7	47.0	44.4
44	Foundries	26.1	28.7	33.0	34.2	30.5	32.4	34.3	34.6	31.0	32.2	26.7	25.6
45	Aluminium works.	58.9	52.3	52.5	53.6	54.1	56.5	60.4	56.3	63.3	56.8	62.2	61.2
46	Other metals ...	63.7	73.4	85.3	81.4	68.9	72.0	78.2	77.8	80.4	78.6	79.1	79.8
47	Metal foundries.	60.4	47.8	45.6	43.8	45.9	49.3	55.8	49.7	89.9	75.1	55.8	77.9
48	Metal products .	46.5	47.7	45.6	47.5	47.0	48.2	49.2	48.6	49.8	48.1	49.5	50.0
49	Electrical machinery	60.2	58.2	55.8	55.1	50.3	52.1	53.6	55.5	51.8	52.0	54.9	53.4
50	Shipbuilding ...	40.4	42.7	40.5	46.2	46.1	50.4	51.7	50.9	52.1	53.5	56.0	57.2
51	Miscellaneous ..	38.8	36.9	30.9	34.4	36.0	38.5	41.9	42.5	41.8	42.8	44.5	44.5
52	Construction ...	55.4	54.1	54.1	57.2	59.6	59.3	58.2	59.1	59.1	60.1	61.7	62.6
53	Electricity	5.5	6.4	7.0	7.5	7.2	6.3	6.6	6.2	4.5	4.6	5.3	5.6
54	Gas supply	62.5	60.0	57.7	65.2	72.7	59.1	68.2	76.6	78.5	71.8	61.4	70.0
55	Trade	24.3	24.6	25.6	25.0	24.0	24.0	25.5	25.2	24.9	26.2	26.5	26.4
56	Central bank ...	17.7	17.7	23.5	29.4	29.4	27.8	27.8	31.4	27.0	28.1	24.2	26.4
57	State banks	30.0	30.0	27.2	27.2	33.3	33.3	30.8	28.5	22.5	26.7	25.5	22.8
58	Commercial banks	14.6	15.0	15.3	16.8	17.6	17.0	16.9	16.7	17.6	20.7	21.5	19.9
59	Life insurance .	28.9	28.9	23.9	25.0	25.0	24.1	22.0	24.8	24.2	27.1	26.2	26.6
60	Non-life insurance	24.0	25.5	25.4	26.4	26.6	25.3	26.9	26.8	25.7	27.6	27.4	26.8
61	Real estate	8.1	7.8	8.3	8.0	12.3	8.2	8.3	9.8	9.6	10.0	9.7	10.1
62	Dwellings	8.6	8.6	8.3	8.1	8.6	8.2	8.4	8.4	8.2	7.9	7.9	8.1
63	Ocean transport.	46.1	44.5	41.1	41.3	40.7	42.8	41.7	40.7	39.4	38.4	38.6	38.1

Appendix table I. (cont.) Sum intermediate inputs in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
64	Coastal transport	40.4	43.9	42.1	38.8	38.8	39.7	40.5	43.4	47.4	49.4	49.3	43.9
65	Port services .	27.6	27.4	24.0	23.6	21.4	23.1	21.6	21.6	20.9	20.2	20.5	20.6
66	Railways	17.2	16.8	16.7	15.3	16.6	15.7	15.0	15.0	14.1	15.8	14.5	13.2
67	Tramways	11.6	11.6	10.7	12.0	10.7	10.7	12.3	11.4	13.2	14.0	13.9	13.6
68	Transport n.e.c.	30.8	30.5	28.7	26.1	26.2	26.6	25.1	26.4	26.3	25.9	25.8	26.4
69	Air transport .	48.5	50.4	58.9	60.8	54.6	59.2	53.3	48.4	50.5	45.7	43.5	40.5
70	Forwarding	53.5	51.3	48.1	48.1	51.7	49.5	51.5	49.0	46.7	52.4	47.1	44.7
71	Communications.	16.1	16.7	16.6	16.7	16.3	17.2	15.7	16.4	17.0	17.4	17.0	17.4
72	Education	.9	.9	.8	.8	.8	1.0	.9	1.0	1.0	.9	.8	.8
73	Health services	13.2	18.3	17.3	17.5	18.1	18.5	19.6	18.7	16.4	17.7	15.8	15.8
74	Religious	8.9	8.5	9.3	9.0	8.5	7.8	8.9	8.8	7.9	8.4	8.3	7.9
75	Institutions ..	7.9	10.6	10.5	12.9	10.6	12.5	16.0	18.2	16.5	17.1	15.0	18.9
76	Consultants ...	9.3	9.5	9.4	8.3	8.2	8.5	9.1	9.4	8.9	9.1	9.9	9.4
77	Recreation	32.2	29.3	29.2	28.0	28.9	30.1	30.6	28.8	27.2	30.5	32.2	31.9
78	Hotels etc. ...	21.2	21.8	21.8	20.8	20.8	20.5	21.0	20.3	20.2	20.0	19.0	22.6
79	Laundry	20.5	20.9	20.3	22.2	23.1	22.8	24.1	23.0	21.0	20.0	21.4	22.6

Appendix table II. Sum intermediate inputs and wage and salary payments in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sectors	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1	Agriculture .	37.4	36.9	35.3	34.7	32.2	33.4	39.5	36.8	34.8	35.1	36.1	39.6
2	Foresty	52.1	58.8	57.3	50.7	49.9	49.6	45.6	42.6	42.8	42.8	41.6	40.4
3	Hunting	5.7	5.7	5.7	6.1	5.2	5.1	6.5	4.7	4.0	4.0	5.6	5.9
4	Fishing	31.1	27.6	23.4	24.7	28.9	24.8	25.4	25.4	30.0	34.7	33.8	34.0
5	Whaling	66.2	56.5	56.8	54.8	54.1	51.9	62.7	58.1	53.4	52.6	53.0	66.6
6	Coal mining .	55.1	70.5	55.0	61.9	61.9	83.9	84.4	84.4	99.2	103.2	83.9	62.0
7	Metal mining.	54.3	62.3	67.4	60.9	53.6	50.6	45.2	45.4	45.8	45.0	44.0	44.4
8	Quarrying ...	47.7	47.1	39.0	36.8	40.2	38.7	43.5	37.3	43.1	41.2	35.4	35.4
9	Slaughtering.	95.0	90.3	94.6	93.0	93.9	95.8	92.9	90.9	90.1	90.2	89.0	87.8
10	Dairies	138.4	131.8	134.2	132.8	134.8	139.3	138.1	134.0	135.2	129.1	128.3	128.8
11	Margarine ...	82.0	82.2	80.0	82.8	82.1	82.7	81.8	80.7	82.6	83.9	85.1	86.0
12	Fish canning.	89.7	91.8	92.6	88.3	86.7	90.9	88.5	94.5	87.8	90.7	92.7	95.4
13	Fish processing	86.5	82.2	76.5	86.1	89.7	90.0	85.0	81.2	80.1	83.6	86.7	94.6
14	Grain mills .	101.9	102.0	101.6	100.0	99.8	100.1	98.0	97.3	96.9	94.1	96.2	95.6
15	Bakeries	68.5	67.1	69.7	68.4	69.4	69.7	68.9	68.2	69.9	70.6	69.7	69.9
16	Chocolate ...	53.6	44.7	41.9	44.9	46.2	47.6	49.2	46.3	45.1	45.4	43.7	43.4
17	Other food ..	83.3	80.4	74.8	77.7	79.7	81.1	76.9	87.2	82.3	85.8	89.2	86.9
18	Spirits	22.1	21.6	24.9	27.1	29.8	30.7	33.2	26.5	40.0	35.3	35.8	36.7
19	Breweries ...	45.6	47.4	43.0	41.9	41.5	41.5	39.5	37.7	37.7	37.7	36.1	36.7
20	Tobacco	34.5	34.3	34.7	33.1	32.8	33.8	34.5	34.2	33.4	32.4	32.3	33.5
21	Textiles	79.0	82.1	82.2	85.3	84.8	83.4	85.2	81.4	84.7	79.3	81.6	77.3

(cont.)

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Appendix table II. (cont.) Sum intermediate inputs and wage and salary payments in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
22	Knitting mills	81.9	89.4	80.6	77.9	79.7	82.9	82.5	76.2	77.2	81.5	82.9	81.4
23	Cordage	83.6	86.8	88.1	78.4	82.1	81.5	76.9	80.7	82.0	75.5	89.9	89.2
24	Footwear	80.2	82.1	82.0	80.4	80.0	81.7	82.1	80.4	81.6	85.3	78.0	77.7
25	Apparel	88.8	82.5	81.1	84.8	86.2	84.9	82.8	81.4	78.2	79.2	73.6	74.4
26	Sawmills	94.4	92.0	93.3	91.7	90.0	89.6	91.4	95.0	94.7	92.1	93.9	89.2
27	Wood and cork.	97.2	92.2	84.5	81.9	82.7	81.1	78.7	76.4	75.8	78.0	76.5	72.7
28	Wood pulp	86.0	85.3	84.1	88.2	84.4	82.4	83.1	80.5	78.4	78.4	75.9	75.7
29	Paper	81.6	84.0	84.4	86.4	80.8	80.0	82.2	84.9	83.0	84.4	83.3	85.1
30	Wallboards ...	72.5	73.2	72.2	70.1	66.6	64.0	64.0	64.9	61.3	54.4	58.3	57.1
31	Paper products	76.5	75.0	79.8	75.6	80.0	83.3	79.2	78.2	79.6	79.8	75.2	72.2
32	Publishing ...	95.7	94.5	91.3	92.9	97.2	93.3	94.8	89.3	92.7	94.6	92.4	86.7
33	Printing	83.7	90.8	89.7	86.7	78.9	78.0	78.1	83.9	83.2	87.2	87.0	88.4
34	Leather	79.4	79.0	80.1	86.1	87.5	84.8	82.6	82.2	80.6	78.6	80.3	73.8
35	Rubber products	81.9	80.1	77.6	86.2	86.0	82.1	78.6	74.1	83.5	82.9	79.2	75.4
36	Basic chemicals	67.1	66.2	60.4	68.1	68.4	64.1	65.2	66.7	66.6	67.9	62.0	68.8
37	Other chemicals	94.4	85.6	83.9	82.9	79.6	73.9	76.5	75.4	72.1	72.0	71.4	71.0
38	Herring oil ..	132,7	118.9	99.5	95.7	91.1	88.8	93.9	85.4	89.9	91.1	98.7	92.1
39	Vegetable oil.	88.1	109.7	114.4	132.5	128.3	137.6	129.2	126.1	126.5	131.0	126.7	132.2
40	Oil refineries	111.6	96.9	103.6	94.7	92.6	90.3	91.3	92.9	95.9	99.5	99.3	102.3
41	Mineral products	89.5	91.1	87.7	84.2	80.8	77.5	77.5	74.4	70.7	71.6	70.3	67.1
42	Ferro-alloys .	97.6	90.3	78.8	87.5	84.0	89.8	83.2	70.5	78.6	77.8	72.0	68.9

(cont.)

Appendix table II. (cont.) Sum intermediate inputs and wage and salary payments in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
43	Steel works .	93.6	88.3	81.6	71.6	78.9	68.8	92.0	80.3	71.5	74.3	65.4	60.0
44	Foundries ...	85.0	83.6	87.7	86.1	76.8	78.1	80.5	74.9	68.3	71.6	64.1	60.9
45	Aluminium works	92.5	80.0	79.4	77.8	77.0	79.8	80.1	73.5	81.1	72.5	76.8	75.1
46	Other metals.	73.5	83.6	96.0	92.4	78.5	80.8	87.8	87.2	89.2	86.6	86.2	86.4
47	Metal foundries	118.2	89.8	83.9	83.0	88.9	93.3	84.7	76.7	118.7	107.4	82.1	114.1
48	Metal products	95.9	91.5	84.9	88.1	85.2	83.4	82.7	81.2	81.1	77.3	78.8	76.3
49	Electrical machinery ...	97.0	91.7	86.6	85.9	79.6	79.5	79.8	82.2	77.6	76.0	78.5	72.9
50	Shipbuilding.	86.3	87.8	84.4	89.0	82.3	86.3	86.9	84.3	85.9	85.4	88.4	87.4
51	Miscellaneous	76.9	70.9	63.7	66.8	66.2	65.9	68.7	67.5	64.6	65.4	66.7	64.0
52	Construction.	86.6	85.4	84.1	85.7	88.2	87.5	86.3	87.2	85.8	86.8	87.9	88.1
53	Electricity .	37.6	36.6	36.2	35.8	34.0	30.7	29.2	28.0	24.1	22.4	22.7	21.4
54	Gas supply ..	94.0	90.3	86.8	98.1	107.1	93.5	97.7	101.9	101.7	90.9	82.6	90.3
55	Trade	45.1	45.6	46.3	44.8	43.5	43.1	45.0	44.4	43.9	45.8	45.4.	44.3
56	Central bank.	63.1	63.1	68.9	74.8	74.8	79.2	87.8	93.1	83.3	80.2	77.4	80.5
57	State banks .	103.8	103.8	94.2	94.2	94.8	94.8	87.7	87.0	87.5	88.2	85.9	75.2
58	Commercial banks	59.7	59.2	59.0	60.6	61.3	60.4	60.6	59.3	60.1	63.3	63.6	60.4
59	Life insurance	93.5	93.5	84.3	82.7	81.0	83.2	73.7	71.1	68.8	67.9	65.1	66.7
60	Non-life insurance ...	55.8	57.1	56.1	56.2	55.5	54.8	55.9	53.9	53.7	56.4	53.6	53.4
61	Real estate .	8.8	8.5	9.0	8.7	13.0	8.8	8.9	10.7	10.5	10.9	10.5	10.9

Appendix table II. (cont.) Sum intermediate inputs and wage and salary payments in 1955 purchasers' prices as percentages of outputs in 1955 producers' prices 1949-1960

	Sector	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
62	Dwellings	9.2	9.2	9.0	8.7	9.3	8.9	9.1	9.0	8.9	8.6	8.5	8.7
63	Ocean transport	63.0	61.0	56.9	56.3	55.2	57.0	56.1	54.2	52.9	52.2	52.2	51.4
64	Coastal transport	84.6	87.4	83.7	80.3	81.1	77.9	76.5	79.7	85.1	87.1	84.9	75.9
65	Port services.	87.4	79.9	72.2	70.6	66.4	64.7	61.6	61.7	63.3	62.2	62.5	62.5
66	Railways	93.0	94.3	91.8	87.7	81.6	88.1	82.7	82.1	78.5	78.9	75.6	68.7
67	Tramways	49.4	50.8	52.3	52.3	52.3	52.3	53.9	53.4	60.1	64.1	64.5	62.5
68	Transport n.e.c.	60.6	59.0	56.0	52.8	52.9	52.0	49.7	51.7	51.4	50.9	50.4	50.4
69	Air transport.	70.0	74.0	88.0	86.8	76.6	80.3	71.7	65.2	66.7	60.7	58.6	54.3
70	Forwarding ...	90.1	87.0	83.0	84.4	86.9	82.2	84.5	88.6	89.7	99.3	92.7	96.4
71	Communications	91.1	90.8	89.8	89.0	83.8	83.1	75.9	77.9	77.9	77.4	73.0	71.7
72	Education	99.1	99.6	99.0	101.8	98.8	99.5	99.8	94.0	92.5	89.3	86.5	90.3
73	Health services	74.4	76.8	72.1	71.1	70.5	70.1	71.1	71.3	71.1	71.7	69.9	68.4
74	Religious	125.6	112.4	117.2	113.9	107.4	102.8	103.9	99.8	96.0	99.4	97.3	94.0
75	Institutions .	102.6	103.9	113.4	124.9	122.0	127.1	130.6	137.4	136.4	135.1	124.8	119.4
76	Consultants ..	44.6	49.0	48.7	47.2	46.4	46.1	45.5	52.0	48.9	47.3	49.8	49.8
77	Recreation ...	63.7	59.1	57.8	54.3	54.5	55.6	56.1	53.7	51.4	54.2	55.4	54.0
78	Hotels etc. ..	75.2	77.9	78.0	75.3	74.6	73.8	74.5	73.8	77.0	75.9	70.3	71.7
79	Laundry	56.5	57.8	58.3	61.8	65.1	67.3	68.9	69.1	65.5	64.6	64.3	64.7