Capital and Labour in Irish Manufacturing Industry

Some Statistical Material

by

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with an addendum by Kieron A. Kennedy

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The availability of R.N. Vaughan's annual estimates of gross
and net capital stock for each manufacturing industry for the period 1945-1973
[5] must inspire many research papers, of which the present, dealing with
levels and trends in recent years, is the first and simplest.   In fact .
the present article is a presentation of derived statistics
related to capital stock data for manufacturing industries.   We confine our
attention to the eleven years 1963-1973: 1973 was not only the last year of the
Vaughan capital stock data but it was also the latest year preceding the recession
of the years 1974-1976, and notably a good year for industry; in 1963 the
industrial upsurge which began ca. 1960 was well set.   It also happened that in
1977 CSO published a very convenient table of indices of volume of gross output
of each CIP industry,   for the period 1963-1973 [3].

First we set up seven tables of basic data for 45 manufacturing
industries and 11 years, in fact matrices 46 x 11 (including a final 46th row for
the total), as follows:-

A. Output volume indices (1953 as 100);

B. Average number of persons engaged;

C. Gross capital stock at constant (1958) prices;

D. Remainder of net output at current prices;

E. Employee remuneration at current prices;

F. Gross output at current prices;

G. Net output per person engaged;

As to the third head, we considered the gross concept of capital stock as the
more suitable for our purpose.   Broadly, this concept implies that tangible
capital is valued as new throughout its lifetime, a definition apt for the analysis

of productivity with which we shall be largely concerned. We need not be precise

about definitions of gross and net, dealt with fully in [5]. In any case in

analysis we are not much concerned with absolute values of capital but rather

with trends in which all that matters is the relative year-to-year values.

Incidentally, Vaughan's are end of year values: we table simple averages of

consecutive end-year values, designed to represent annual averages.

Earlier results

Before starting the present paper we had completed another

[1] part of which centres around a series of estimates of gross capital stock

in each CIP industry by E.W. Henry [2] These estimates

covered a long period of years up to and including 1968. The paper dealt

statistically with other aspects for later years.

At the macro level it was shown that what has been termed

in USA the "mysterious" phenomenon was very much in evidence in UK and

probably in Ireland (though the macro capital data here was more speculative

than was the case in the other two countries). This phenomenon was the

persistent tendency for the national volume of output to increase far more than

might be expected from the application of the factors labour and capital stock.

In fact, we showed that in the years 1966-1974 labour and

capital input in UK explained only 29 per cent of annual average increase in

output, "the remaining 71 per cent being due to other causes, including better

replacement capital, greater efficiency of labour and management, better

materials etc." The more tentative estimate for Ireland in the period 1960-

1973 showed even more drastic results: factor input left unexplained 85 per cent

of average annual rate of increase in actual output volume. In 1960-1968

amongst 22 industrial groups, annual average percentage rise in actual output exceeded that of factor input (usually by a large amount) except in the case of creameries, alcoholic beverages, fertilisers, vehicles and construction. Capital stock per unit labour increased in all 22 groups without exception between 1960 and 1968: there were only 4 exceptions in the previous period 1953 to 1960. A surprising result was the entire absence of relationship between (i) the increase in the ratio of capital stock per unit labour and (ii) the actual growth in gross volume output amongst the 22 industrial groups. For 1953-1960, r = -.21; for 1960-1968, r = -.27. Both negative signs are perverse but neither is statistically significant.

Using a full CIP list of manufacturing industries very similar to that used in this paper, the relationships between 1 capital per worker, 2 earnings per worker and 3 female/male ratio (44 industry units, year 1968), it was found that r_{12} = .63, r_{13} = -.46, r_{23} = .68, all significant at the NIIP = .001 critical point. The really significant relationship is the value $r_{12.3}$ = .49, so that the relationship between capital intensity and average earnings sex-corrected is emphatic.

In this earlier paper we also examined the relations between employment (Y) and volume of production of manufacturing industry (X) in four periods to find the following OLS regressions:-

1: 1953 - 60: Y_c = -0.66 + 0.54 X

2: 1960 - 66: Y_c = -1.05 + 0.62 X

3: 1966 - 73: Y_c = -1.12 + 0.43 X

4: 1973 - 76: Y_c = -2.38 + 0.53 X

All the coefficients of X are highly significant, but only one of the intercepts, that for 1973-76, a recession period. The persistence of the negative sign of the intercept will be noted. We felt entitled to assume a normal relationship

as follows: In manufacturing industry percentage increase in employment is equal to half percentage increase in volume of production less one.

We also used this data to examine whether during the periods since 1953 there was a persistent tendency between successive periods towards large or small increases in volume of production. With numbering of periods as shown in the last paragraph, $r_{12} = .40$, $r_{23} = .52$, $r_{34} = .48$, all significant at NHP = .01. An industry with a high (low) percentage increase in output in one period is likely to be followed by a high (low) increase in the next. Planning on the basis of recent results is likely to be successful, in the near future at any rate.

We would hope that the results of this previous analysis would enable us to formulate hypotheses in regard to the concentrated period of years 1963-1973 we use here. We have varied our technique somewhat in the light of experience gained.

Aggregate data for 1963-1973

From now on attention is directed to manufacturing industry, to which the Vaughan capital stock estimates are confined. Table 1 dealing with 16 prime aggregates,is a mixture of current and constant price data, items

[Table 1]

lettered D, E, G, M, Q, R in the current category; the CPI (R) is supplied to enable rough assessment of the real value of these items. We hope the table will be useful to other researchers and commentators. Our own comments are based on Table 2, in which we show the annual average rates of change of all the items in each of the 6-year periods 1963-1968, 1968-1973.

[Table 2]

These rates are 100 b, b being given as the OLS solution of

$$Y = a_e^{\,bt} \quad \text{or}$$

$$\log_e Y = \log_e a + bt,$$

Y being each of the 16 data in each of the two periods, t time in years.

Items 1 and 2 in Table 2 point to the familiar problem of the great shortfall between increases in output volume and the labour force involved. The formula of relationship from the earlier research was percentage increase in employment as one-half of percentage increase in volume output less one. This formula would yield 2.0 and 1.7 per cent increases in employment in the two periods both in excess of 1.6 and 1.5 per cent shown. The closeness in 1968-1973 is statistically satisfactory and not trivial, for the earlier result was "cross-sectional", as based on some 45 industries as units whereas the Table 2 regression coefficients were based on time series applied to aggregates. As we have seen mention authoratively of employment percentage increase being one-half of volume output increase, we feel entitled to insist that a deduction of $1-1\frac{1}{2}$ per cent should be made.

Heads C and K may be considered together, K the more important. In ten years the volume of capital stock per person engaged in manufacturing industry increased from £1,900 to £3,430 or by 81 per cent and Table 2 shows that the rate of increase is increasing. The values shown in Table 1 for item Q (rate of profit) mean little in the absolute for they depend on the definition of capital, an objection which, however, should not apply to the Table 2 percentages. The increase in the current rate of profit (item Q) trebled between 1963-1968 and 1968-1973. Real rate of profit (item T) fell by 0.9 per cent in 1963-1968 and increased by a mere 1.5 per cent in 1968-1973. The corresponding employee real earnings rates (item S) were 3.5 and 5.5, thus increasing substantially between the two periods and always in excess of the corresponding increase in capital earnings.

Items H, J, V   are a reminder that there are many kinds of

productivity, though <u>labour</u> productivity (item H) is usually intended when

the single word "productivity" is used. In addition to those shown, energy

productivity, material input productivity, etc., each the quotient of output

volume by volume of the particular factor, could be calculated. Between the

two periods there was little change in rate of increase in labour productivity

at about 4 per cent, a substantial decline in the falling rate of capital productivity

and in consequence a near-halving in the small rate of increase in factor

productivity.

From the manner of computation of factor productivity (see Notes

to Table 2) we may confront actual with expected rates of increase of volume of

output:-

	1963-1968 %	1968-1973 %
Actual	5.9	5.4
Expected	3.2	3.9
Difference	2.7	1.5
Difference as % actual	47	28

The "mysterious" phenomenon referred to earlier as regards the whole economy

is not nearly so much in evidence in manufacturing: factor input "explains" more

than half actual output increase in 1963-1968 and nearly three-quarters in 1968-

1973.

Individual Industries

As stated at the outset we have prepared tables for all items A-H

for each industry for each year 1963-1973, each table a 46 x 11 matrix. In addition

we have the following tables:-

H   = A ÷ B: labour productivity

J   = A ÷ C: capital productivity

K   = C ÷ B: capital per unit labour

L   = D ÷ C: pseudo rate of return on capital

M   = E ÷ B: employee remuneration per head

N   = F ÷ A: industrial output price

In all we have 14 tables, each a 46 x 11* matrix. For a synthesis we then prepared percentage rates of change for each item for each industry in the two periods 1963-1968 and 1968-1973, so that ultimately we had data for each of 45 industries and total all industries, somewhat on the lines of those of Tables 1 and 2 for the whole of manufacturing industry. We do not consider that this large amount of material should be included in this paper. Instead, we shall make it freely available to students, industrialists etc. at ESRI. In Tables 3 and 4, however, we give some excerpts.

Some questions and answers

Our main object is to provide data for information and research relating to the new R. N. Vaughan estimates of capital stock of Irish manufacturing industries. We allow the tables here to speak for themselves, refraining from such obvious showings as the industries which are largest or smallest in this or that characteristic, leaving this exercise to the reader.

We have, however, asked our data a number of questions, largely prompted by the earlier research. The method used involved only simple correlation and OLS regression. Following are eight observations. Critical NHP points for 42 d.f. for assessment of significance of the c.c.s are as follows:

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*R. N. Vaughan was unable to obtain data for estimation of value of capital stock for industry no.42: manufacture of railroad equipment. In consequence, tables involving capital values, namely C, J, K, L, are matrices 45 x 11 (including total). No adjustment was made for this omission in Table 1 and 2 as the amounts involved would be negligible.

NHP	.1	.05	.01	.001
Critical c.c. value	.25	.28	.38	.48

Units were the 44 or 45 individual industries.

1. Level of output probably depends on capital intensity. Variables involved are G and K and r(GK) was computed for three years only:-

	1963	1968	1973
r(GK)	.52	.43	.41

All three are significant at NHP = .01.

2. Increased output does not depend on increased capital intensity:-

	1963-1968	1968-1973
r(A'K')	-.13	.15

3. While formally average pay does not depend on capital intensity, one notices the persistance of positive r = .2 in the three selected years:-

	1963	1968	1973
r(KM)	.19	.20	.24

It might be argued that there is some weak relation.

4. Increase in average pay was strongly related to increased capital intensity in the earlier period but not in the later:-

	1963-1968	1968-1973
r(K'M')	.46	.07

The later lack of relationship may be an effect of the intensification of new industrialisation.

5. Any relationship between increase in pseudo-profit rate must be regarded as doubtful, although the 1968-1973 c.c. is significant at NHP = .05:-

	1963-1968	1968-1973
r(L'M')	.08	.31

6. To assess the continuity (or otherwise) of increase in real output in 1968-1973 (I) compared with 1963-1968 (II) we calculated $r(A'_I A'_{II})$ as .40, significant at NHP = .01. In short-term planning it would be prudent in selection of industry to take into account the results of the recent past, as we found in earlier research [1].

7. The question may be asked whether increase in average remuneration of employees kept pace with increases in (i) volume of output and (ii) value of net output per person engaged. Relevant c.c.s are:-

		1963-1968	1968-1973
(i)	r(A'M')	.23	.40
(ii)	r(G'M')	.32	.56

While there is a spurious element in the calculation of (ii) r(G'M')

(because remuneration of employees is part of net output) it seems likely that there

is a genuine positive relationship, especially in the later period. The phenomena

shown favour negotiation within firms as distinct from uniform percentage changes

over the whole economy (except perhaps in the very short period). It will be

borne in mind that within each industry net output per employee can vary

effectively in the range 4:1 [6] .

8. Another question is whether increase in net output per person engaged at

current prices depends on increases in labour productivity, capital productivity

and industrial output price.

The O.L.S. regressions are:-

1963-1968

$$G'_c = \text{constant} + 0.86H' + 0.15J' + 1.01 N'$$
$$\quad\quad\quad (4.69)\quad (1.05)\quad (5.62)$$

$F(3,40) = 27.0$ multiple $r = .82.$

1968-1973

$$G'_c = \text{constant} + 0.52 H' + 0.18 J' + 0.69N'$$
$$\quad\quad\quad (6.50)\quad\quad (1.90)\quad (6.65)$$

$F(3,40) = 20.1$ multiple $r = .77.$

t = values in brackets.

Relationships are overwhelmingly significant (F (3,40) = 5.0 for NHP = .005).

In each period increase in net output per head is satisfactorily "explained".

While the individual coefficients are without significance because

of collinearity the similarity in form of the two regressions will be noted.

The associated c.c.s have an interest in themselves:-

	1963-1968			1968-1973		
	G'	H'	J'	G'	H'	J'
G'	1			1		
H'	.63	1		.40	1	
J'	.56	.80	1	.16	.42	1
N'	.21	-.40	-.32	.27	-.59	-.48

The most remarkable figure is the very strong relationship (r = .80) between increases in labour and capital productivity in the earlier period, if much lower in the later. Again, there may be a statistically spurious element in these and other c.c.s in this section because of the same factor appearing in each pair; e.g. in productivity the numerator is always volume of output. One hopes that the spuriousness is mitigated by one's dealing with percentage increases and not absolutes. It is scarcely surprising that net output per person engaged is closely correlated with labour and capital productivity, especially in the earlier period.

The most telling results in this latter set of c.c.s is the high negative relationship between productivities and prices, far more marked in the later period, though the negative signs correspond in both.

Units. Using the 44 or 45 individual industries as units in these calculations may require justification. All industries are similar except in a few respects, such as the products they make or the materials they use. An entrepreneur would apply exactly the same standards, using the information at his disposal, to all industries (in much more detail than the 45, of course) were he contemplating investment in men and tangible capital.

Conclusion

This is a statistical exercise. Our main object has been to provide data for information of, and analysis by, others. To repeat, we shall be glad to place our unpublished material, much more voluminous than the tables in this paper,

at the disposal of researchers. Even as regards our own rudimentary analysis, comment is purely statistical and wider aspects are sedulously avoided.

10 July 1979.

References

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[3]   Irish Statistical Bulletin, various issues.

[4]   National Income and Expenditure, 1975, compiled by the Central Statistics Office, 1977 (Prl.6248).

[5]   Vaughan, R. N.:"Capital Stock In Irish Industry, 1945 -1973" To be published.

[6]   Linehan, T.P., "The Structure of Irish Industry", Journal of the Statistical and Social Inquiry Society of Ireland, 1961-62, comment by R. C. Geary.

Table 1. Aggregate data for manufacturing industry, 1963-1973

Item	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
A. Output volume indices (1953 as 100)	151.0	162.5	169.9	175.3	188.7	207.6	223.7	230.6	240.0	250.8	280.3
B. Average no. persons engaged (000)	168.2	171.8	172.8	174.6	177.3	183.9	194.5	197.6	196.5	197.3	203.2
C. Gross capital stock (£m at 1958 pr.)	319.7	344.5	370.0	397.3	426.0	456.9	494.0	535.9	580.2	635.8	696.4
E. Employee remuneration (£m)	88.6	100.7	106.3	116.4	128.0	144.4	169.7	197.4	226.1	262.3	319.6
D. Remainder of net output (£m)	85.7	95.4	105.7	117.0	139.2	161.5	188.9	206.9	236.8	277.1	376.5
G. Net output per person engaged (£000)	1.04	1.14	1.23	1.34	1.51	1.66	1.84	2.05	2.36	2.73	3.43
P. Estimated profit (£m)	38.2	38.3	42.7	42.9	52.7	64.8	73.7	79.7	88.9	125.2	166.8
K. Cap. stock per employee (C÷B) (£000)	1.90	2.01	2.14	2.28	2.40	2.48	2.54	2.71	2.95	3.22	3.43
M. Employee remun. per emp. (E÷B) (£)	527	586	615	667	722	785	872	999	1151	1329	1573
Q. Est. profit per £100 capital (P÷C) (£)	11.9	11.1	11.5	10.8	12.4	14.2	14.9	14.9	15.3	19.7	24.0
R. Consumer price index (year 1968 as 100)	80.2	85.6	89.9	92.6	95.5	100	107.4	116.2	126.7	137.5	153.3
REAL EARNINGS (1968 as 100)											
S. Employee (M÷R) (year 1968 as 100)	83.7	87.2	87.1	91.8	96.3	100	103.4	109.5	115.7	123.1	130.7
T. Capital (Q÷R) (year 1968 as 100)	104.5	91.3	90.1	82.1	91.4	100	97.7	90.3	85.1	100.9	110.3
PRODUCTIVITY (1968 as 100)											
H. Labour (A÷B, year 1968 as 100)	79.5	83.8	87.1	88.9	94.3	100	101.9	103.4	108.2	112.6	122.2
J. Capital (A÷C, " " " ")	103.9	103.8	101.1	97.1	97.5	100	99.6	94.7	91.0	86.8	88.6
V. Factor (A÷B + C " " " ")	85.8	89.1	91.1	91.3	95.3	100	101.2	100.6	102.2	103.1	109.4

Basic sources: [3] [4] [5]

Notes

Item P was estimated by multiplying the NIE estimates for income of industry other than remuneration of employees by the ratio of remainder of manufacturing industry to the remainder for all industry, from CIP records.

The denominator of item V was the "expected" volume output found as the sum-product of number of employees and value of gross capital multiplied respectively by average earning and rate of return on capital in 1968, the mid-year of the series.

Items A - M are as elsewhere in the paper.

Additional items, only in this table, are P - V.

Table 2. Annual average rates percentage change in periods 1963-1968 and 1968-1973 in items in Table 1

Item	1963-68 %	1968-73 %
A. Output volume indices (1953 as 100)	5.9	5.4
B. Average no. persons engaged (000)	1.6	1.5
C. Gross capital stock (£m at 1958 pr.)	7.1	8.4
E. Employee remuneration (£m)	9.3	15.5
D. Remainder of net output (£m)	12.6	15.8
G. Net output per person engaged (£000)	9.3	14.2
P. Estimated profit (£m)	10.3	18.4
K. Cap. stock per employee (C÷B (£000)	5.5	6.9
M. Employee remun. per emp. (E÷B (£)	7.7	13.9
Q. Est. profit per £100 capital (P÷C) (£)	3.3	10.0
R. Consumer price index (year 1968 as 100)	4.2	8.5

REAL EARNINGS

Item	1963-68	1968-73
S. Employee (M÷R) (year 1968 as 100)	3.5	5.5
T. Capital (Q÷R) (year 1968 as 100)	-0.9	1.5

PRODUCTIVITY

Item	1963-68	1968-73
H. Labour (A÷B, year 1968 as 100)	4.3	3.8
J. Capital (A÷C, " " " ")	-1.2	-3.0
V. Factor (A÷B+C " " ")	2.8	1.5

Basic source: Table 1.

Table 3: Output, employment, gross capital stock in each manufacturing industry, 1963, 1968, 1973

Industry	A Output volume indices (1953 as 100)			B Persons Engaged (No.)			C Capital Stock (£m.)		
	1963	1968	1973	1963	1968	1973	1963	1968	1973
1. Bacon	118.9	143.7	164.2	4445	4614	4600	7.56	10.32	14.05
2. Slaughtering	239.1	358.1	439.6	2723	3652	4240	3.59	6.32	10.97
3. Milk Products	137.0	227.7	329.3	4787	6565	7710	13.38	26.00	42.34
4. Canning	110.0	170.8	208.5	3355	3819	3360	5.41	8.75	12.51
5. Grain, animal feed	112.8	127.8	156.1	5124	4627	4710	16.59	20.48	26.32
6. Bread	93.3	99.4	107.2	9595	9882	9245	21.23	24.25	29.57
7. Sugar	111.6	120.8	140.1	2662	1829	1835	7.58	9.20	10.27
8. Sugar confectionery	78.9	110.9	116.5	5129	5057	4880	11.63	15.60	18.19
9. Miscellaneous food	105.4	145.9	148.0	870	1017	1700	19.30	31.81	50.36
10. Margarine	165.6	291.7	534.7	296	367	445	11.67	12.50	16.96
11. Distilling	90.9	118.8	174.3	675	682	340	4.19	4.98	5.76
12. Malting	129.0	149.6	217.6	764	636	369	2.32	2.94	5.26
13. Brewing	119.9	127.1	157.4	4678	5024	4523	28.89	38.89	49.96
14. Aerated waters	148.3	227.4	428.1	1612	1719	2290	3.74	5.22	8.39
15. Tobacco	87.8	87.2	109.7	2289	2328	2260	5.81	8.65	12.21
16. Woollen, worsted	153.7	204.2	252.6	6660	7384	6340	10.70	14.27	21.10
17. Linen, cotton	227.8	294.2	263.2	4001	3597	2620	6.99	8.91	10.88
18. Jute, canvas	242.7	284.0	592.4	4007	4076	4705	6.43	8.93	22.37
19. Hosiery	181.6	326.1	540.5	6470	8140	8260	9.02	13.58	20.23
20. Boot, shoe	136.8	152.1	147.6	5967	5542	4920	3.79	4.90	6.75
21. Men's, boys' clothing	91.5	103.7	132.6	5313	5146	5230	2.87	3.34	4.07
22. Shirtmaking	151.4	196.7	201.5	2189	2365	2920	0.85	1.16	1.73
23. Women's, girls' clothing	167.6	218.9	265.5	7692	8323	7440	3.01	4.59	5.93
24. Misc. clothing	152.4	166.9	150.9	1255	1156	760	0.72	0.81	0.82
25. Made-up textiles	209.2	316.5	517.7	782	819	1085	0.84	1.10	1.29
26. Wood (ex. furniture)	117.4	147.6	191.7	3514	3723	4170	5.51	7.05	11.49
27. Furniture	148.5	159.0	180.3	4154	4093	4425	2.87	3.75	5.48
28. Paper	199.4	287.5	377.1	5186	5411	5710	11.23	16.09	20.41
29. Printing	154.2	176.8	200.0	9722	10132	10700	15.77	19.57	23.94
30. Fellmongery	131.9	134.0	143.8	1647	1520	1360	3.28	3.87	4.76
31. Leather	182.5	180.9	187.7	780	826	670	1.10	1.35	1.37
32. Fertilisers	317.1	443.7	722.5	1591	2149	2360	8.16	19.14	24.51
33. Oils, paints	144.3	185.9	222.1	1378	1436	1460	4.01	4.88	6.03
34. Chemicals, drugs	237.5	719.5	1364.2	2116	2911	4200	5.01	7.57	24.09
35. Soap	131.7	161.7	163.5	731	795	710	1.99	2.56	2.77
36. Glass, pottery	185.8	265.2	403.9	2956	3254	4880	4.15	6.80	14.86
37. Clay, cement	181.6	364.4	621.3	3967	5186	6880	14.34	26.65	51.00
38. Metals (ex. machinery)	231.6	366.3	532.0	9910	11078	15430	16.42	23.83	49.85
39. Machinery (ex. electrical)	274.1	298.9	456.4	2529	2448	4015	4.84	6.07	10.50
40. Electrical machinery	439.1	751.2	937.5	6794	9553	12010	7.06	12.01	18.48
41. Ships, boats	190.4	152.2	268.8	1303	1149	2020	3.11	3.48	6.47
42. Railroad equipment	57.4	43.1	44.5	2549	2089	2100			
43. Road vehicles, mechanical	190.6	239.1	270.9	5853	6865	8220	10.60	13.94	17.28
44. Road vehicles (ex. mechanical)	124.8	140.3	157.4	1349	1631	1620	1.31	2.75	4.01
45. Misc. manufactures	313.5	589.0	958.3	6830	9238	13315	16.69	27.47	51.52
Total manufacturing industry	151.0	207.6	280.5	168199	183853	203165	319.70	456.91	757.07

Sources: A, B [3]; C [5]

Table 4: Annual unitary rates of increase in certain items of individual manufacturing industries in two periods I 1963-1968 and II 1968-1978.

Ind.No.	A' I	A' II	B' I	B' II	C' I	C' II	H' I	H' II	J' I	J' II	K' I	K' II	L' I	L' II	M' I	M' II	N' I	N' II
1	0.031	0.023	0.012	0.001	0.062	0.065	0.056	0.022	-0.031	-0.041	0.050	0.063	0.051	0.077	0.067	0.153	0.037	0.092
2	0.123	0.034	0.084	0.025	0.109	0.111	0.049	0.009	0.014	-0.077	0.025	0.086	-0.021	0.140	0.082	0.139	0.045	0.153
3	0.103	0.078	0.059	0.033	0.129	0.092	0.044	0.044	-0.026	-0.014	0.069	0.059	0.083	0.134	0.089	0.149	0.004	0.143
4	0.078	0.036	0.010	-0.030	0.096	0.072	0.058	0.066	-0.018	-0.036	0.046	0.103	0.031	0.023	0.090	0.143	0.031	0.051
5	0.021	0.038	-0.023	-0.001	0.043	0.051	0.044	0.039	-0.022	-0.013	0.066	0.052	0.079	0.103	0.080	0.137	0.035	0.080
6	0.015	0.017	0.007	-0.011	0.026	0.042	0.008	0.028	-0.011	-0.025	0.019	0.053	0.054	0.081	0.065	0.137	0.043	0.080
7	0.035	0.026	-0.080	0.001	0.030	0.021	0.116	0.025	0.005	0.005	0.110	0.019	0.100	0.179	0.098	0.151	-0.004	0.084
8	0.067	0.015	-0.004	-0.010	0.058	0.029	0.071	0.024	0.009	-0.014	0.062	0.039	0.001	0.099	0.068	0.143	0.014	0.078
9	0.052	0.010	0.025	0.094	0.100	0.038	0.037	-0.024	-0.037	-0.078	0.075	-0.006	0.098	0.098	0.082	0.142	0.072	0.213
10	0.099	0.115	0.048	0.024	0.013	0.063	0.051	0.041	0.086	0.052	-0.035	0.039	0.114	0.025	0.063	0.134	-0.010	-0.026
11	0.061	0.075	0.009	-0.159	0.036	0.027	0.052	0.234	0.025	0.048	0.027	0.186	0.195	-0.021	0.067	0.121	0.072	-0.000
12	0.026	0.073	-0.040	-0.131	0.045	0.118	0.006	0.294	-0.019	-0.045	0.085	0.249	0.022	0.064	0.105	0.165	0.030	0.118
13	0.020	0.045	0.011	-0.024	0.060	0.049	0.009	0.069	-0.041	-0.004	0.050	0.073	-0.036	0.144	0.098	0.148	0.028	0.110
14	0.080	0.125	0.008	0.056	0.069	0.095	0.073	0.069	0.012	0.031	0.061	0.038	0.046	0.132	0.078	0.144	0.033	0.095
15	-0.008	0.035	0.007	-0.010	0.076	0.072	-0.014	0.045	-0.063	-0.037	0.069	0.082	-0.017	0.056	0.086	0.123	0.069	0.019
16	0.055	0.032	0.019	-0.044	0.055	0.077	0.035	0.076	-0.001	-0.044	0.036	0.121	0.135	0.019	0.083	0.150	0.010	0.076
17	0.039	-0.016	-0.023	-0.072	0.047	0.045	0.002	0.056	-0.008	-0.061	0.070	0.117	-0.003	-0.054	0.086	0.130	0.010	0.068
18	0.021	0.147	-0.002	0.020	0.063	0.194	0.023	0.128	-0.042	-0.047	0.065	0.174	0.065	0.023	0.089	0.162	0.040	0.059
19	0.104	0.097	0.043	-0.011	0.078	0.080	0.001	0.108	0.026	0.017	0.035	0.091	0.065	-0.005	0.076	0.128	-0.005	0.007
20	0.012	-0.023	-0.016	-0.034	0.049	0.063	0.026	0.011	-0.038	-0.087	0.065	0.097	-0.014	0.014	0.065	0.121	0.028	0.106
21	0.020	0.040	-0.012	0.004	0.031	0.041	0.032	0.036	-0.011	-0.000	0.043	0.036	0.061	0.097	0.074	0.134	0.040	0.079
22	0.037	0.002	0.009	0.030	0.061	0.078	0.028	-0.028	-0.024	-0.076	0.052	0.046	0.043	0.158	0.064	0.150	0.038	0.153
23	0.050	0.023	0.018	-0.028	0.079	0.049	0.032	0.052	-0.029	-0.026	0.061	0.077	0.047	0.067	0.072	0.136	0.038	0.087
24	0.011	-0.010	-0.023	-0.079	0.022	0.008	0.034	0.069	-0.011	-0.018	0.045	0.087	0.005	0.015	0.073	0.127	0.033	0.067
25	0.077	0.098	0.003	0.060	0.053	0.023	0.074	0.038	0.024	0.075	0.051	-0.037	0.118	0.182	0.077	0.186	0.021	0.081
26	0.041	0.053	0.009	0.020	0.046	0.092	0.033	0.033	-0.004	-0.039	0.037	0.072	0.075	0.072	0.080	0.138	0.050	0.117
27	0.009	0.028	-0.004	0.010	0.050	0.075	0.014	0.017	-0.041	-0.047	0.055	0.064	0.029	0.081	0.070	0.123	0.058	0.125
28	0.060	0.062	0.006	0.009	0.071	0.045	0.053	0.053	-0.011	0.016	0.064	0.036	0.027	0.134	0.069	0.133	0.013	0.085
29	0.027	0.025	0.010	0.012	0.042	0.037	0.017	0.012	-0.015	-0.013	0.032	0.025	0.061	0.125	0.073	0.126	0.053	0.113
30	-0.000	0.026	-0.020	-0.019	0.032	0.040	0.020	0.045	-0.032	-0.014	0.052	0.059	0.010	0.142	0.062	0.129	0.031	0.148
31	-0.024	0.015	0.004	-0.045	0.045	0.002	-0.029	0.060	-0.069	0.013	0.041	0.047	-0.019	0.111	0.089	0.129	0.071	0.086
32	0.080	0.074	0.076	0.017	0.191	0.045	0.004	0.057	-0.111	0.029	0.114	0.028	-0.097	0.130	0.108	0.161	0.044	0.050
33	0.046	0.041	0.004	-0.004	0.040	0.043	0.043	0.045	0.006	-0.002	0.037	0.046	0.033	0.066	0.079	0.133	0.014	0.090
34	0.229	0.100	0.068	0.072	0.088	0.256	0.101	0.028	0.140	-0.156	0.020	0.184	0.306	-0.107	0.087	0.164	0.067	0.086
35	0.033	0.028	0.005	-0.026	0.052	0.016	0.026	0.053	-0.019	0.011	0.047	0.042	0.205	0.059	0.095	0.133	0.086	0.058
36	0.067	0.077	0.017	0.084	0.046	0.168	0.050	-0.007	-0.030	-0.091	0.079	0.084	-0.013	-0.022	0.094	0.125	0.023	0.107
37	0.132	0.105	0.050	0.059	0.123	0.130	0.082	0.046	0.009	-0.025	0.073	0.072	0.021	0.079	0.084	0.148	0.011	0.101
38	0.080	0.063	0.013	0.059	0.070	0.140	0.007	0.004	0.010	-0.077	0.057	0.081	0.061	-0.001	0.075	0.125	0.030	0.097
39	0.006	0.081	-0.011	0.095	0.042	0.109	0.017	-0.014	-0.036	-0.028	0.053	0.015	0.110	0.106	0.080	0.132	0.045	0.149
40	0.107	0.028	0.064	0.031	0.107	0.081	0.043	-0.003	0.000	-0.053	0.043	0.050	0.126	0.044	0.085	0.123	0.040	0.116
41	-0.031	0.102	-0.011	0.106	0.021	0.124	-0.021	-0.004	-0.052	-0.022	0.032	0.018	0.018	0.043	0.042	0.145	0.047	0.087
43	0.024	0.017	0.027	0.032	0.059	0.046	-0.003	-0.015	-0.035	-0.029	0.032	0.014	0.056	-0.059	0.070	0.125	0.042	0.086
44	0.023	0.037	0.044	0.007	0.137	0.079	-0.021	0.030	-0.114	-0.041	0.093	0.071	-0.182	0.111	0.056	0.182	0.061	0.125
45	0.119	0.079	0.052	0.069	0.100	0.124	0.067	0.010	0.019	-0.045	0.048	0.055	0.025	0.082	0.062	0.144	-0.003	0.088
All	0.059	0.054	0.016	0.015	0.071	0.084	0.043	0.038	-0.012	-0.030	0.055	0.076	0.033	0.100	0.077	0.139	n.a.	n.a.

Basic sources: [3], [4], [5].

Notes

For industry no. code see Table 3. No. 42 is missing in Table 4 because capital stock estimates are not available. Unitary figures translated into percentages by x 100. Thus first figure 0.031 is 3.1 per cent. For item code (A, B, etc.) see text and notes to Table 1. Primes indicate unitary changes of specified items. All figures for L'are those of Q of Table 1, regarded as more reliable than estimates based on remainder of net output.

ADDENDUM

by

Kieran A. Kennedy

An interesting point arises in Table 2. Looking at the change between the two periods 1963-1968 and 1968-1973, it is clear that even though productivity growth, however measured, _fell_ between the two periods, the growth of real earnings of _both_ factors was substantially _higher_ in the second period than in the first. (One can imagine the glee of some trade-unionists in noting that the lower the growth rate of productivity, the more the real earnings of _both_ labour _and_ capital rose!). Furthermore, considering the period 1968-1973 alone, it may be seen that, even though total factor productivity rose by only 1.5 per cent, the real earnings of capital rose at the same rate, and those of labour rose at a substantially higher rate. (Again, our trade unionist would rejoice in noticing that the rise in the combined real returns to labour and capital substantially exceeded the growth rate of the combined productivity of these factors, something that many economic commentators have often suggested to be impossible!).

The explanation lies along the following lines. The measure of real earnings used in the paper is defined by reference to the Consumer Price Index. An alternative would be to measure real earnings in terms of the price of the sector's own output. Let us assume for the moment that the volume of manufacturing value-added rose at the same rate as the volume of gross output (series A), which in turn involves the assumption that materials, purchased services, etc. volume per unit of gross output volume was constant. We can then readily get a measure of the implied price of the sector's own production by deflating the index of value-added (employee remuneration (E) plus estimated profit (P)), by the volume index (A).

The following point then emerges:

	1963-68	1968-73
CPI	4.2	8.5
Implied price of value-added	3.7	11.1
Real Earnings (CPI)		
L	3.5	5.5
K	-0.9	1.5
Real Earnings (V.A. price)		
L	4.0	2.8
K	-0.4	-1.1

Now it emerges that the growth of real earnings (in terms of own product price) of both labour and capital has fallen in the second period compared with the first. Further if we (crudely) weight the growth rates of real earnings using the

2.

shares of wages and profits in value-added (roughly 70 per cent and 30 per cent, respectively) the following emerges for the growth of combined real earnings in relation to the growth of combined factor productivity:

	1963-68	1968-73
Combined real earnings (CPI)	2.2	4.3
Combined real earnings (V.A. price)	2.7	1.6
Combined factor productivity	2.8	1.5

The last two are now virtually identical. In fact they should be identical, given the accounting relations involved, if all the calculations were done consistently and without rounding errors.

In that sense the result might be considered trivial, but I think it does throw light on the reasons for the substantial deviation between the growth of combined factor productivity and combined real earnings (in terms of the Consumer Price Index). There are in fact two possible explanations. One lies in the realm of prices: the sector's value-added price may have risen far more than the Consumer Price Index in the second period. In turn, this may arise not because the sector's gross output price rose more than the Consumer Price Index but because of an improvement of the terms of trade for the sector as between its gross output price and its materials etc. price.

But an entirely different possibility also exists, namely that the measure of productivity is totally misleading in the second period. The assumption made in doing the above calculations was that materials etc. volume per unit of gross output volume was constant. If this were not in fact true, then it is possible that the volume of value-added rose considerably more than the volume of gross output in the second period, in which case the true growth rate of the physical productivity of labour and capital would be seriously understated in the figures shown in the paper.

It is not possible to say on a priori grounds which of these possibilities, or what combination of them, accounts for the data. Further research would be needed to throw light on the question, which I think is an interesting one, given the orders of magnitude involved.

13 September 1979