CHANGES IN IRISH EXPORTS

(SECOND PAPER).

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IN a previous Paper (read to this Society on April 26th, 1918)
I analysed the figures for the Exports at Irish Ports which
have been published by the Department of Agriculture and
Technical Instruction for Ireland for the twelve years 1904
to 1915 inclusive.   I grouped together those items in the
annual Return which were products of the same industry or
employment ; and I   compared the value-changes which
have occurred in the principal exporting trades during the
twelve years.   Since then the Department has issued the
Return for the year 1916.   Applying to it the same method
of analysis, I get the following results :—

TABLE I.—EXPORTS OF IRELAND IN 1916.

(The figures are Estimated Values, sterling).

Order of 1913).				£
I. Linen (4) ...	...	...	...	19,804,702
II. Cattle (6) ...	...	...	...	20,464,086
III. Bacon (6) ...	...	...	...	7,069,095
IV. Poultry (3)	...	...	...	8,122,834
V. Butter (5) ...	...	...	...	6,853,848
VI. Steamers (1)	...	...	...	6,322,543
VII. Cotton Goods (1)	...	...	...	3,503,851
VIII. Brewing (3)	...	...	...	3,540,860
IX. Whiskey (1)	...	...	...	4,272,578
X. Woollens (9)	...	...	...	3,155,404
XI. Sheep (3) ...	...	...	...	2,438,680
XII. Horses (3) ...	...	...	...	596,480
XIII. Pigs (2) ...	...	...	...	2,051,878
Total (above) (47) ...		...	...	88,196,839
Other Exports (281)		...	...	18,974,178
Total Exports (328)		...		... £107,171,017

The figures in brackets after the name of each exporting
industry in this table is the number of the separate items in
the Department's Return which have been added together to
obtain the total value given in the table as exported by that
industry in the year 1916.   We notice that the Return gives

us 328 items of exported products, of which 281, being mis-
cellaneous small items which only make up 18 millions sterling,
are here ignored—no one item among them amounts to half
a million of value. The 47 items that make up the values
exported by the thirteen chief exporting industries of Ireland
were set out by name in my previous Paper, and they must
be grouped in a precisely uniform way for all the thirteen
years over which the Department's Returns extend. The
thirteen exporting industries are written always in the same
order to facilitate comparisons of year with year : it is the
order of their magnitude by value in the year 1913—the
year before the War made conditions abnormal.

I gave this analysis in my previous Paper for each of the
twelve years, and the comparison revealed extraordinary
changes in the values exported. Ireland was there shown to
have become mainly an industrial country so far as exports
are concerned ; it was the industrial exports that were
increasing, while the exports of Live Stock were stationary
or retrograding. This result of the investigation was so
surprising that it invited further examination. It is obvious
that when exports are measured by their money-values, the
element of price-fluctuations can play a great disturbance
of the figures. I propose in the present Paper to eliminate
this element of prices, and to obtain a measure of the quan-
tities exported in a form which will allow comparison of year
with year. If my measure of the quantities exported be
accepted as correct, it will be easy to discern how far the
remarkable changes in Irish Exports during these 13 years
were caused by changes in prices and how far they were the
expression of a real expansion in the volume of the trade
itself.

I will consider only the four years 1904, 1908, 1913, and
1916. I omit 1912, because the Larkin Strike of that year
held up the export trade of Dublin for three months ; and I
wanted to have 1913 because it was the last normal year
before the War. In Table II. I give the analysis by money-
values of the Exports for the four years stated.

I must now re-write this table so as to display the percen-
tage growth of the figures since 1904. In other words, for any
line horizontally across Table II. I put the number 100 in
place of the figure for 1904 ; and I calculate the proportionate
number for each figure in the other years along that horizontal
line. The last table then appears in the form shown by
Table III.

TABLE II.—IRISH EXPORTS FOR FOUR DIFFERENT YEARS.

(The figures are Estimated Values, sterling).

Exporting Industry. (Order of 1913).	1904.	1908.	1913.	1916.
	£	£	£	£
I. Linen ...	9,026,890	10,167,234	16,572,208	19,804,702
II. Cattle ...	8,985,336	10,935,197	15,464,468	20,464,086
III. Bacon ...	2,205,657	3,249,170	4,430,061	7,069,095
IV. Poultry ...	2,887,772	3,560,449	4,048.088	8,122,834
V. Butter ...	3,271,827	4,185,180	3,954,611	6,853,848
VI. Steamers ...	1,500,000	2,900,000	3,148,000	6,322,543
VII. Cotton Goods	1,320,802	1,468,947	2,722,350	3,503,851
VIII. Brewing ...	1,879,445	1,931,239	2,554,044	3,540,860
IX. Whiskey ...	2,343,496	2,299,964	2,008,500	4,272,578
X. Woollens ...	989,832	1,247,285	1,852,554	3,155,404
XI. Sheep ...	1,747,677	1,723,223	1,784,142	2,438,680
XII. Horses ...	1,291,165	1,347,225	1,705,260	596,480
XIII. Pigs ...	1,742,039	1,332,258	1,024,197	2,051,878
Total (above)	39,191,938	46,347,371	61,246,483	88,196,839
Other Exports	10,206,598	11,067,606	12,639,927	18,974,178
Total Exports	49,398,536	57,414,977	73,886,410	107,171,017

TABLE III.—PERCENTAGE GROWTH IN EXPORT VALUES.

(Value exported in 1904 = 100).

Exporting Industry. (Order of 1913).	1904.	1908.	1913.	1916.
I. Linen	100	112·6	183·5	196·8
II. Cattle	100	121·7	172·1	227·7
III. Bacon	100	147·3	209·0	324·9
IV. Poultry	100	123·3	140·1	281·3
V. Butter	100	124·8	120·9	209·4
VI. Steamers* ...	100	132·5	162·7	276·1
VII. Cotton Goods ...	100	111·2	206·1	265·2
VIII. Brewing	100	102·8	135·9	188·4
IX. Whiskey	100	98·1	85·7	182·3
X. Woollens	100	126·0	187·1	318·7
XI. Sheep	100	98·6	102·0	139·5
XII. Horses	100	104·3	131·9	45·4
XIII. Pigs	100	76·4	58·8	117·8
Total Exports ...	10	116·2	149·5	216·9

* Steamers here (unlike Table II) are averages of two-year periods, 1904-5, 1907-8, 1912-3, 1915-6.

This table needs no commentary. But the surprising lift in all the figures as we pass into the War period makes the impression that inflated prices rather than expanding trade must be the chief cause of the great increase in the values exported. The problem presents itself, therefore, can we obtain a measure of the volume of the trade free from the disturbance of price-changes, can we measure exports by *quantities* instead of by *values* ?

The usual method of solving this problem would be as follows :—the exports of any year, such as 1916, are to be recalculated according to the prices which existed at the base year 1904. If the total quantities exported in 1904 for each article of trade be divided into the total values of each such article in that year's exports, we get an averaged export-price for each article as in 1904. Take, then, the *quantities* (only) exported in any subsequent year 1916 ; multiply them by these averaged export-prices for 1904 ; and we obtain the materials for measuring *what the exports of* 1916 *would have amounted to if valued at the prices of* 1904. If we did the same thing for 1908, 1913, and 1916,—and arrayed the results in the form resembling Table II. above : then the figures would show the expansion of trade undistorted by mere price fluctuations.

It sounds a laborious bit of work to do this. But, in the case of British Foreign Trade, this calculation is done for us every year, by Papers like the *Economist* ; and it is a very necessary thing to do. In reality, the fluctuations of our Imports and Exports are principally due to price-changes : when these are eliminated, then we are often surprised how small are the changes merely in quantity. This is especially the case with Imports : in fact, consumption of goods (but also production of goods) is found to go on with only very gradual changes from year to year. The recalculation is rendered easier for British Imports and Exports, because those " averaged prices," both of exports and imports (*i.e.* the results of dividing total values by total quantities) have been calculated for each article every year by the Board of Trade and are always put on record in the *Statistical Abstract for the United Kingdom.* So one merely takes from the *Statistical Abstract* the prices of the base year (say, 1904), and multiplies the *quantities* for the current year (say, 1916) by those base-prices, and the calculation is quickly done.

Nevertheless, this thing is not found so simple when one starts doing it. The " averaged prices," which we can take from the *Statistical Abstract*, are only mathematical terms, and not actual market prices. Moreover there are

many articles comprised in our Exports and Imports for which an " averaged price " is an absurdity : for example " machinery," " carpets," " pictures," etc.   The recalculation in question, then, has to be carried out for all goods that can be separately valued, omitting such articles as cannot be said to have any " averaged price."   The change in the part that can be recalculated is then *assumed to apply also proportionally* to the part that does not admit of recalculation. For example, if 378 millions sterling be the Exports for any year, 1909, at the prices of 1909, and we try to recalculate what this would be at the prices of (say) 1900 taken as a base year.   We find, perhaps, that 310 millions (out of the total 378 millions) are goods that can be separately valued : and, when recalculated at 1900 prices this 310 is found to work out at 273 millions, let us suppose.   We then assume that the whole 378 millions would, if it could all be re-priced, be reduced in this ratio of 310 : 273 ; so that gives us the mathematical figure 332·9, or 333 millions.   We then conclude that the 378 millions at the prices of 1909, are the equivalent of 333 millions at the prices of 1900.

This is the usual method by which Exports are freed from price-fluctuations.   But, if you have gone with me in the explanation, you will, perhaps, share my feeling that the method is artificial, besides being tedious.   And I was not satisfied to apply to Irish Exports the " averaged prices " in the *Statistical Abstract* which were worked out from British Exports.   Consequently I have tried another method ; *I have used the principles of index-numbers* to obtain a measure of the *quantity* of our export trade, apart from the fluctuations of prices.

TABLE IV.—EXPORTS OF IRISH LINEN INDUSTRY.

	QUANTITIES.		VALUES, £.	
ITEM.*	A. 1904.	B. 1916.	C. 1904.	D. 1916.
a. Flax (*tons*) ...	2,641	4,664	132,050	436,317
b. Linen Yarn (*lbs.*)	20,163,700	18,020,576	1,232,356	2,027,315
c. Linen Goods (*cwt.*)	972,924	1,083,208	7,296,930	16,248,120
d. Thread (*lbs.*)	2,024,132	5,522,212	365,554	1,092,950
			9,026,890	19,804,702

* A small doubtful item, " Waste (Flax, Tow, and Hemp), is omitted.

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To illustrate the application of *index numbers* to this
problem, I will consider in detail the figures for the Linen
Trade for the year 1916, as compared with the year 1904.
The Department's Returns supply the particulars of quantities
and values for the four items that make up the exports of
the Linen Trade, which are set out in Table IV.

Here the figures in columns C and D can be added, and
the totals at foot are the same figures as appeared already
in Table II. for the " Estimated Values " of the Linen
Exports for 1904 and 1916.   But the *Quantity* figures in
columns A and B, being in discrete units, cannot be added :
our problem is to obtain an *index number* that will measure
each of those columns.   Taking 1904 as the base with
which other years will be compared, we represent each figure
in Column A by the number 100 ; and we calculate the
proportional numbers which then represent the corresponding
figures in Column B.   The result is Table V.

TABLE V.—PERCENTAGE CHANGE IN LINEN EXPORTS (*Quantities*)

			1904.	1916.
a. Flax (*tons*)	...	...	100	177
b. Linen Yarn (*lbs.*)		...	100	89
c. Linen Goods (*cwt.*)		...	100	111
d. Thread (*lbs.*)		...	100	189

Now, the simple arithmetic mean of the index numbers
in the last column is 141·5 : can we take it as a measure
of the 1916 column ?   To do so would be to assume that
the four items (a, b, c, and d) are of equal importance.   But
the money-values of those items, shown by Column D in
Table IV., are very unequal ; and, it so happens, that the
smaller items (a and d) show much larger percentage changes
than the important items (b and c).   I take these money-
values to be a correct measure of their relative importance.
In place of a simple arithmetic average, therefore, we require
to have a *weighted average* of the 1916 index numbers of
Table V.,—using as *weights* the figures shown in Column D
of Table IV.   This *weighted average* works out* at 114·5

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* By the theory of Index Numbers, the " weights " yield the same
weighted average even if only relatively approximate.   Now the four
large figures in Column D of Table IV. are relatively approximate to
4, 20, 162 and 10 ; and therefore to 2, 10, 81, and 5.   We may now
use these last figures as the " weights." and the *weighted average* will
be practically the same.   It will be found to be 114·28 ; as compared
with 114·56 when the large figures were used as " weights."   In this
manner the calculations are much simplified and shortened.

which figure we take to be the Index Number that measures the *quantity* of the Linen Trade Exports in the year 1916. The *quantities* exported by the Linen Industry had risen from 100 in 1904 to 114·5 in 1916 ; whereas, (as we have shown in Table III.), the *values* exported by the Linen Industry had undergone the much greater rise from 100 in 1904 to 196·8 in 1916. The disparity between these results reveals the effects of mere price-changes upon the estimated values of the exports, apart from the growth of the trade.

As we have now obtained an Index Number (114·5) to measure the change in the *quantities* exported for the Linen Industry, so by the same process we can obtain a corresponding Index Number for 1916 to measure the change in the *quantities* exported in the Cattle Industry, and each of the other principal export-industries of Ireland. Only in the case of Shipbuilding, we had better average the output for two-year periods, 1904-5, 1907-8, 1912-3, and 1915-6, --in order to distribute tonnages over two years when very large ships are launched. (N.B.—For the war-period, 1915-6, the tonnages built were not disclosed). And what we can do for the year 1916. we can do in the same manner for other years. The results in Table VI. were thus obtained.

TABLE VI.—PERCENTAGE CHANGES IN QUANTITIES EXPORTED

(Quantities for Year 1904=100).

Exporting Industry. (Order of 1913)			1904	1908.	1913	1916
I. Linen	...	...	100	97·5	120	114·5
II. Cattle	...	..	100	111 8	148·3	142·9
III. Bacon	...	...	100	129·2	139·1	150·8
IV. Poultry	...	...	100	119·9	118	146·5
V. Butter	...	...	100	112·8	112·3	156·3
VI. Steamers*	...	...	100	134·6	134·0	—
VII. Cotton Goods		...	100	98·8	130·1	124·8
VIII. Brewing	...	...	100	122·7	162·1	171·8
IX. Whiskey	...	.	100	93·9	85·8	45·6
X. Woollens	...	.	100	169·6	234·6	332·2
XI. Sheep	...	...	100	101·4	88 6	87·1
XII. Horses	...	...	100	104·3	131·9	25·9
XIII. Pigs	...	...	100	77·1	39·5	55·0
Average No. for Year		...	100	113·3	126·5	129·5

* Steamers, in averages of two-year periods, 1904–5, 1907-8, 1912–3, 1915-6.

The view given in this table of the growth in volume of Irish Exports is interesting from many points. The astonishing growth in the output of the Woollen Industry is unparalleled. But the Brewing and Bacon Industries have also extended their exports to a remarkable degree for such a short period of time as twelve years. All the manufacturing industries, except Whiskey, show steady progress. All the Live Stock trades are less healthy-looking [N.B.—The Cattle figure for 1913 is abnormal, because the Larkin Strike had stopped the Dublin trade for some three months of 1912]. The rise between 1913 and 1916 in nearly all items shows the emphatic demand for Irish products in war-time ; which had operated for Horses previous to the outbreak of hostilities. The decline in Pigs is nearly equivalent to the rise in Bacon : which, if it be cause and effect, is a satisfactory feature.

It remains only to compare the *Quantity* changes in Irish Exports with the changes in *Values* in order to see how the contemporaneous increase of prices has operated. This can best be seen in Table VII. which combines together the previous Tables III. and VI.,—the darker figures enclosed in brackets representing Quantities and the other figures representing Values. This table may be let speak for itself. It tells a remarkable story for each of the thirteen principal exporting industries of Ireland. In regard to two of them, the Woollens and the Brewing, this table points to a peculiarity, viz. : the *Quantity* figures are larger than the *Value* figures,—except in the year 1916. This seems to show that the products in these industries had experienced a fall of prices,—until the war year 1916. In the case of Horses, it may be noticed that the *Quantity* and *Value* figures are alike, except in 1916. But in this case, probably, the Department has nothing but *Quantity* figures to handle ; the statistician had put an average price applicable to all horses of the same sort. If I may guess what he did, he seems to have valued every Stallion at £250 all the time ; and every Mare and Gelding was valued at £45 every year except the last, when for 1916 he raised this figure to £80. Of course, it was necessary to value them at some figure, in order that the total Exports of Ireland might be aggregated in its money values. The difficulties under which the Department brings out its annual Return of the Trade in Imports and Exports at Irish Ports, owing to the absence of legal powers to require adequate returns from Traders and Shippers were dwelt on in my previous Paper and are, perhaps, not always appreciated by those who may make use of these very important statistics of Irish external trade

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TABLE VII.—PERCENTAGE CHANGES IN IRISH EXPORTS DURING THIRTEEN YEARS.

[Darker figures, in brackets=Quantities ; other figures=Values.   Year 1904=100]

(Order of 1913).	1904.	1908.	1913.	1916.
I.—Linen	100 (100)	112·6 (97·5)	183·5 (120)	196·8 (114·5)
II.—Cattle	100 (100)	121·7 (111·8)	172·1 (148·3)	227·7 (142·9)
III.—Bacon	100 (100)	147·3 (129·2)	209·0 (139·1)	324·9 (150·8)
IV.—Poultry	100 (100)	123·3 (119·3)	140·1 (118)	281·3 (146·5)
V.—Butter	100 (100)	124·8 (112·8)	120·9 (112·3)	209·4 (156·3)
VI.—Steamers*	100 (100)	132·5 (134·6)	162·7 (134·0)	276·1 (—)
VII.—Cotton Goods ...	100 (100)	111·2 (98·8)	206·1 (130·1)	265·2 (124·8)
VIII.—Brewing	100 (100)	102·8 (122·7)	135·9 (162·1)	188·4 (171·8)
IX.—Whiskey	100 (100)	98·1 (93·9)	85·7 (85·8)	182·3 (45·6)
X.—Woollens	100 (100)	126·0 (169·6)	187·1 (234·6)	318·7 (332·2)
XI.—Sheep	100 (100)	98·6 (101·4)	102·0 (88·6)	139·5 (87·1)
XII.—Horses	100 (100)	104·3 (104·3)	131·9 (131·9)	45·4 (25·9)
XIII.—Pigs	100 (100)	76·4 (77·1)	58·8 (39·5)	117·8 (55·0)
Total Value All Exports ...	£49,398,536	£57,414,977	£73,886,410	£107,171,017
Percentage of 1904 Values ...	100	116·2	149·5	216·9
Average Quantity Index No.	(100)	(113·3)	(126·5)	(129·5)

* Steamers, are averages of two-year periods 1904-5, 1907-8, 1912-3, 1915-6.