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the evidence surely does not substantiate a claim that production of materials, relative to unutilized capacity existing at the beginning of the war, has expanded much more rapidly in this war than in the preceding. The record is substantially the same.

II Changes in Output of Individual Industries

The indexes discussed in Section I show that the aggregate output of industrial materials expanded in both wars, but they do not tell us which industries participated in this expansion and which did not, or whether the industries, if any, that failed to expand in the first war failed also to expand in the second. They show too that in the first three years of both wars the average rate of expansion in the total was about 10% per year, but they do not indicate which industries expanded more rapidly and which more slowly, or whether the same industries behaved similarly in this respect in the two periods. Finally, the indexes suggest that the rate of increase in the total may have been higher in the second war than in the first, but fail to show whether this is true of all products or of what products it is true.

In order to answer these questions we constructed 14 group indexes based on classifications of the 47 commodity series in our total index (Table 4 and Chart 4), and calculated the annual percentage rates of change of the 14 indexes and the 47 series for relevant periods (Tables 5 and 6). In both wars the production of almost all industrial materials expanded. Only two of the 14 indexes, forest products and nonmetal construction materials (which overlap considerably since lumber is the major constituent of each), decline from 1914 to 1917, and only one, products of foreign origin, declines from 1939 to 1942. Thirty-five of the 47 individual commodity series increased in the first war period, 39 in the second. According to the weights used in our index (cf. App. Tables 3 and 5) the aggregate value in 1914 of the commodities that increased from 1914 to 1917 was 78% of the total value of the 47 commodities. The corresponding figure (1939 weights) for the commodities that rose from 1939 to 1942 is 92%. Consequently we may say that the expansion in the second war was more general than in the first.

Five commodity series (turpentine, cottonseed oil, calf and kip leather, distilled spirits, and sugar meltings) declined in both periods; seven (linseed oil, sand and gravel, lumber, crushed limestone, canned tomatoes, malt liquors, and sheep and lambs slaughter) declined in the first but rose in the second; while three (rubber imports, tin con-

TABLE 4

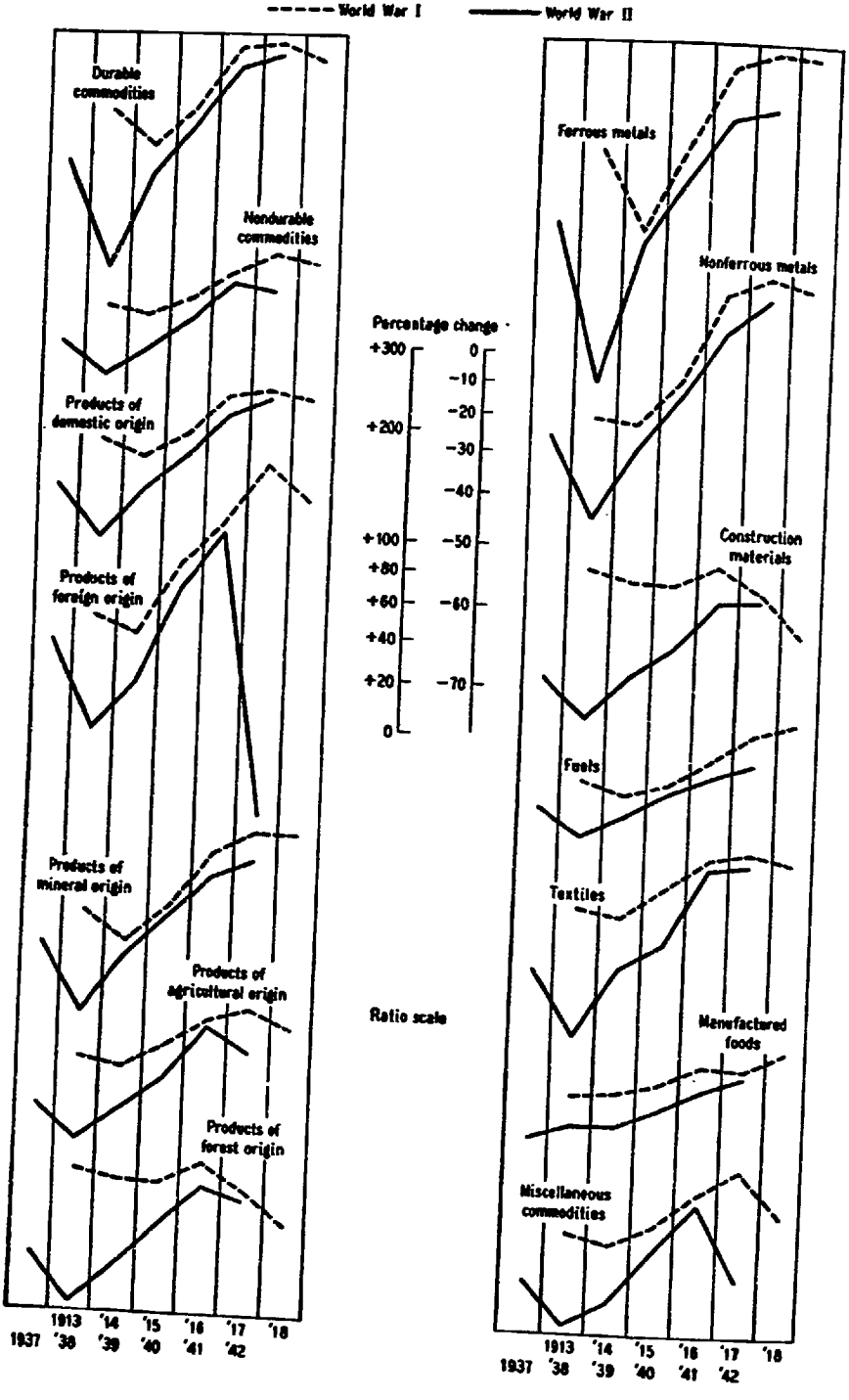
Industrial Materials Production Indexes for Major Groups of Commodities, 1913–19, 1932, and 1937–42

	ALL COMMODITIES	DURABLE COMMODITIES	NON-DURABLE COMMODITIES	PRODUCTS OF: DOMESTIC ORIGIN	PRODUCTS OF: FOREIGN ORIGIN	PRODUCTS OF: MINERAL ORIGIN	PRODUCTS OF: AGR. ORIGIN	PRODUCTS OF: FOREST ORIGIN	FERROUS METALS	NON-FERROUS METALS	CONSTRUCTION MATERIALS (nonmetal)	FUELS	TEXTILES	MFD. FOODS	MISC. COMMODITIES
								(*1914:100*)							
1913	107	113	103	107	107	112	103	103	133	102	104	105	103	99	104
1914	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1915	110	116	106	108	129	114	108	99	137	117	99	104	111	103	107
1916	127	144	117	125	151	139	119	107	182	161	106	114	124	111	121
1917	132	145	125	128	187	150	124	97	192	171	97	126	127	110	132
1918	127	137	121	124	164	149	116	86	189	166	83	129	123	118	112
1919	119	119	119	111	225	126	120	94	147	131	91	116	121	124	119
								(*1939:100*)							
1932	58	37	68	56	81	53	67	45	29	42	48	69	62	92	55
1937	103	104	102	102	117	104	101	103	107	105	99	103	99	95	108
1938	84	71	91	84	84	81	89	87	60	78	86	93	78	100	92
1939	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1940	115	121	111	113	141	116	112	116	127	122	111	109	109	106	121
1941	135	149	127	132	173	134	136	134	157	153	132	116	144	114	143
1942	135	156	124	140	62	142	124	128	163	174	133	122	146	121	109
								PERCENTAGE WEIGHTS							
1914	100	34.8	65.2	92.8	7.2	45.4	41.1	13.4	11.9	7.6	15.4	22.9	12.5	11.2	18.7
1939	100	32.9	67.1	93.2	6.8	56.0	37.0	6.9	16.8	6.5	9.6	28.8	13.4	10.1	14.8

For a list of series included and their weights see Appendix Tables 1 to 5.

CHART 4

Industrial Materials Production Indexes for Major Groups of Commodities
World Wars I and II



sumption, and silk imports) rose in the first but declined in the second. Thus the individual commodities confirm the showing of the group indexes: in the first war the products that did not participate in the expansion were largely construction materials, whereas in the second the non-participating commodities were largely products of foreign origin. In fact, of the seven nonmetal construction materials only two (gypsum and Portland cement) increased in the first war while all except one (turpentine) rose in the second; and of the six products of foreign origin only two (goat and kid leather, and graphite imports) increased in the second war while all except one (sugar meltings) rose in the first.

TABLE 5

Industrial Materials Production Indexes for Major Groups of Commodities Average Annual Percentage Rates of Change, 1914–17, 1939–42, 1932-37

	1914–17	*1939–42*	*1932–37*
Durable commodities	13.2	16.1	23.1
Nondurable commodities	7.8	7.4	8.5
Products of domestic origin	8.6	11.8	12.7
Products of foreign origin	23.2	—14.7	7.3
Products of mineral origin	14.4	12.4	14.5
Products of agricultural origin	7.5	7.6	8.5
Products of forest origin	—1.0	8.6	17.9
Ferrous metals	24.2	17.7	30.3
Nonferrous metals	19.7	20.2	19.8
Construction materials	—1.1	10.1	15.5
Fuels	8.0	6.9	8.4
Textiles	8.4	13.5	9.9
Manufactured foods	3.3	6.6	0.7
Miscellaneous commodities	9.6	2.8	14.5
All commodities	9.7	10.4	12.2

Derived from indexes in Table 4 computed to one decimal place. Average annual rates computed by compound interest method.

The circumstances underlying the two principal exceptions to the general war expansions were, of course, entirely different. The decline in products of foreign origin from 1939 to 1942 was clearly a war phenomenon, reflecting a decline in imports after 1941. Our products of foreign origin index rises rapidly from 1939 to 1941, but the decline from 1941 to 1942 more than cancels the entire rise. Although our index covers only six materials,[15] its behavior is not unlike that

[15] The index includes only those of our 47 commodities that are almost entirely of foreign origin; no attempt was made to include the part of other products (e.g., wool) that is imported. Three of the series included show quantities brought into the country: rubber, silk, and graphite; the other three show quantities of imported goods consumed in this country: tin consumption, sugar meltings, and goat and kid leather production. (In the World War I index tin imports was used instead of tin consumption.)

TABLE 6

Distribution of 47 Industrial Materials Series according to their Average Annual Percentage Rates of Change, 1914–17 and 1939–42

ANNUAL % RATE OF CHANGE, 1914–17	ANNUAL PERCENTAGE RATE OF CHANGE, 1939–42			
	0.0 & under	*0.1–10.0*	*10.1–20.0*	*20.1 & over*
20.1 & over	Rubber (4.3)	Calves (0.3)	Cotton linters (0.1) Sulphur (0.4) Rayon yarn (3.0) Steel (16.8) Zinc (0.8) Copper (2.8)	Magnesium (*) Aluminum (0.8) Graphite (*)
10.1–20.0	Tin (1.3) Silk (0.5)	Goat & kid leather (0.1) Cattle (2.0) Natural gas (5.8)	Sheep & lamb leather (0.1) Cattle hide leather (0.6)	Ethyl alcohol (0.3)
0.1–10.0		Petroleum (13.3) Lead (0.7) Milk (2.9) Leaf tobacco (3.7) Anthracite (2.0) Newsprint (0.2) Wheat flour (1.5)	Bituminous coal (7.7) Cotton (6.0) Woodpulp (0.9) Wool (3.8) Gypsum (*) Portland cement (1.9) Hogs (1.8)	Canned peas (0.1) Canned corn (0.1)
0.0 & under	Sugar (0.6) Turpentine (0.1) Cottonseed oil (0.3) Calf & kip leather (0.1) Distilled spirits (0.3)	Lumber (5.8) Malt liquors (3.8) Crushed limestone (0.6) Sheep & lambs (0.3)	Canned tomatoes (0.1) Sand & gravel (1.1)	Linseed oil (0.1)

Average annual rates are computed by the compound interest method from data in Appendix Table 1. Parenthetic entries are the percentage weights in 1939 (App. Table 5).
* Less than 0.05%.

of the Department of Commerce index of the physical volume of total imports, which also rises from 1939 to 1941 and declines sharply from 1941 to 1942.[16] The decline in imports has evidently been much more severe in this war than in the preceding—our index rises steadily from 1914 to 1917 and declines only slightly from 1917 to 1918.

The output of construction materials, on the other hand, showed no marked tendency to expand at all during the first war. Our index declines slightly from 1914 to 1915, rises from 1915 to 1916 to a level only 6% above 1914, declines from 1916 to 1917 to a level lower

[16] The figures (1939:100) are: 1937, 121; 1938, 87; 1939, 100; 1940, 105; 1941, 124; 1942, 91 (*Survey of Current Business*, 1942 Supplement, p. 88; March 1943, p. S-20; July 1943, p. S-21). Index converted from a 1923-25 base by dividing by the 1939 index, 108.

than in 1914, and declines still further from 1917 to 1918.[17] This is in sharp contrast to the substantial rise in the construction materials index from 1939 to 1942. Since the output of construction materials is related to the volume of construction activity, the latter obviously expanded much more between 1939 and 1942 than between 1914 and 1917. In part this may be due to the relatively small amount of private construction in 1939 and preceding years, in part to the greater volume of military installations and war plant construction required by a war effort that is larger, relative to the civilian economy, than in World War I. The decline from 1917 to 1918 was attributable, at least in part, to governmental restrictions on residential building and the failure of industrial and public construction to make up the difference. An analogous decline took place between 1942 and 1943 (cf. Sec. III). But the relatively low level at the peak in 1916, and the decline from 1916 to 1917 must have some other explanation—perhaps that the war occurred during the contraction phase of a long cycle in building construction.

Despite the difference between the two war expansions with respect to the kinds of commodities whose production failed to increase, there is on the whole a considerable degree of similarity in the relative rates of growth of particular groups of products in the two periods (Table 5). According to the group indexes of output, durable commodities increased more rapidly than nondurable in both periods; mineral products more rapidly than agricultural or forest products; metals more rapidly than any of the other groups; textiles more rapidly than fuels; and fuels more rapidly than foods. The principal shifts in relative position were effected by groups that increased in one war but not in the other: products of foreign origin, forest products, and construction materials. The rates of change in the output of the individual commodities indicate also that, on the whole, the commodities whose production expanded rapidly in the first war experienced rapid growth in the second too (Table 6). But the correlation is by no means perfect. When the rates of change for the 47 commodities are ranked according to magnitude in each period the correlation coefficient is +.37, not very high. Many of the larger discrepancies are accounted for by construction materials and products of foreign origin. If the

[17] These movements correspond rather closely to those of a much more comprehensive index of construction materials output derived from unpublished estimates by W. H. Shaw: 1913, 110; 1914, 100; 1915, 97; 1916, 101; 1917, 91; 1918, 85; 1919, 85.

seven series in the former category and the six in the latter are omitted, the rank correlation coefficient is raised to +.57.[18]

Although the total production of industrial materials apparently expanded somewhat faster from 1939 to 1942 than from 1914 to 1917, the group indexes and individual commodity series indicate that such a tendency was not widespread—the individual commodities and groups that increase less rapidly in the later period are almost as numerous and important (in terms of value) as those that increase more rapidly. Durable commodities increase more rapidly, but nondurable less; products of domestic origin more rapidly, but products of foreign origin less; agricultural and forest products more rapidly, but mineral products less; nonferrous metals, construction materials, textiles, and manufactured foods more rapidly, but ferrous metals, fuels, and miscellaneous products less. Twenty-eight of the 47 individual commodities increase more rapidly from 1939 to 1942 than from 1914 to 1917, 19 less rapidly (Table 7).

The percentage weight columns in Table 7 suggest that trend is one of the factors affecting the differences in the rates at which the production of individual commodities expanded in the two wars. The tendency for the long-run growth in the output of individual commodities to slow down is well known;[19] were our series influenced solely by trend one might expect each to rise less rapidly from 1939 to 1942 than from 1914 to 1917; also the series with the most rapidly rising trends would probably exhibit the greatest reduction in rate of growth. It is the latter effect that is apparently demonstrated by Table 7, since the commodities whose production expanded less rapidly in the second war than in the first became relatively more important (i.e., had rapidly rising trends) from 1914 to 1939, while the

[18] Two other observations on the behavior of the output of industrial materials in the two wars are suggested by Table 6: (1) commodities differed less in respect of rate of change in 1939-42 than in 1914-17; (2) in both periods, but especially in the second, the less important commodities differed more in respect of rate of change than the more important. Both the number and weight of commodities whose production either expanded rapidly (more than 20% per year) or declined were smaller in the second period than in the first; but in both periods the aggregate percentage weight of these commodities was small relative to their number.

Commodities Whose Production Expanded More Than 20% Per Year or Declined

	1914–17	*1939–42*
Number	23	15
Percentage of total number	48.9	31.9
Percentage weight, 1914 prices	43.5	10.1
Percentage weight, 1939 prices	42.4	9.1

[19] A. F. Burns, *op. cit.*, pp. 96-173.

TABLE 7

Distribution of 47 Industrial Materials Series according to the Relative Difference between their Annual Rates of Change, 1914–17 and 1939–42

	NUMBER OF SERIES	% OF TOTAL NUMBER	PERCENTAGE WEIGHT 1914 1914 Prices	1939 Prices	1939 1939 Prices
Commodities whose Rate of Change from 1939 to 1942 is:					
1) Substantially larger than from 1914 to 1917 Portland cement, Sand & gravel, Crushed limestone, Canned corn, Canned peas, Canned tomatoes, Hogs, Sheep & lambs, Malt liquors, Linseed oil, Ethyl alcohol	11	23.5	12.3	13.4	10.3
2) Moderately larger than from 1914 to 1917 Aluminum, Graphite, Gypsum, Lumber, Woodpulp, Cotton, Wool, Calf & kip leather, Cottonseed oil	9	19.1	24.0	27.7	17.8
3) Slightly larger than from 1914 to 1917 Lead, Bituminous coal, Anthracite, Turpentine, Cattle hide leather, Wheat flour, Leaf tobacco, Distilled spirits	8	17.0	26.9	27.0	16.6
4) Slightly smaller than from 1914 to 1917 Copper, Zinc, Petroleum, Natural gas, Newsprint, Sheep & lamb leather, Milk, Cattle	8	17.0	17.2	15.0	27.9
5) Moderstely smaller than from 1914 to 1917 Steel, Sugar	2	4.3	12.4	13.9	17.4
6) Substantially smaller than from 1914 to 1917 Tin, Magnesium, Sulphur, Rayon yarn, Silk, Goat & kid leather, Calves, Cotton linters, Rubber	9	19.1	7.1	3.1	10.0
Total	47	100	100	100	100

Groups 1 to 6, respectively, are defined according to the following values of the ratio of the 1939-42 annual ratio of change (percentage rate of change plus 100) to the 1914-17 annual ratio of change: 1.101 and over, 1.051 to 1.100, 1.001 to 1.050, .951 to 1.000, .901 to .950, .900 and under. Annual ratios of change computed by compound interest method from data in Appendix Table 1.

reverse is true of the commodities whose production expanded more rapidly in the second war.

* * * *

While we cannot undertake to explain in detail the similarities in the behavior of individual commodities and groups in the two wars, we can easily demonstrate that in many respects they characterize peacetime cyclical expansions also. To make a comparison with peacetime conditions the indexes of industrial materials production were computed for 1932. The peacetime expansion from 1932 to 1937 is not an altogether satisfactory standard, since many 'special' conditions affected it, including the fact that the preceding contraction was probably more severe than any the country had ever before experienced. It was chosen because no extensive computation was involved. However, the 1932-37 expansion does have many of the earmarks of a typical business expansion and is at least one type of peacetime expansion with which to compare the wartime model.

As we have observed, the expansions in the output of industrial

materials from 1914 to 1917 and from 1939 to 1942 were *general*. The expansion from 1932 to 1937 was even more general: in this five-year interval every one of our group indexes and 43 of the 47 individual commodity series increased. The four exceptions (4.1% by weight in 1939) were newsprint, silk imports, wheat flour, and hogs slaughter. The generality of the 1932-37 expansion was undoubtedly related to the severity and generality of the 1929-32 contraction. Hence it may be surprising to some that the war expansions compare as favorably as they do with 1932-37. In considering why the war expansions were not more selective it must be remembered that our survey is based largely upon materials rather than finished products and that most materials (as well as many finished products) can be and are used for both 'war-essential' and 'non-essential' purposes. Furthermore, in both wars both civilian and war demand increased, and only in the latter part of the periods considered was there any direct control over the allocation of resources to essential and non-essential uses.

In addition to being more general than the war expansions, the 1932-37 expansion in materials production was more rapid. The average annual percentage rates of change in most of the group indexes and in the total were larger during the five-years 1932-37 than during either of the three-year intervals, 1914-17 or 1939-42 (Table 5). Only two of the 14 group indexes (products of foreign origin and manufactured foods) rose more rapidly from 1914 to 1917 than from 1932 to 1937; only three (manufactured foods, textiles, and nonferrous metals) rose more rapidly from 1939 to 1942 than from 1932 to 1937.

But although the actual rates were higher in the peacetime expansion, the relative differences among them for different groups of commodities are much the same as in the war expansions. In all three periods durables increased more rapidly than nondurables, minerals than agricultural products, metals than any of the other groups, textiles than fuels, and fuels than foods. Judged by the 1932-37 standard, the decline in the output of construction materials in the first war, and the decline in products of foreign origin in the second are 'abnormalities', though apparently the latter alone is directly attributable to war conditions.