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AN INTERNATIONAL COMPARISON OF THE SIZE AND EFFICIENCY OF THE YUGOSLAV PLANT

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Introduction

Using Professor Joe Bain's International Differences in Industrial Structure: Eight Nations in the 1950's[1] as a basis for comparisons, this paper analyzes the size structure of Yugoslav industry and mining in 1963.[2] The purpose of the study is to evaluate the extent to which a small nation, following for twenty years a policy of rapid growth by forced industrialization is hampered by inefficiencies and a consequent low labor productivity emanating from an inadequate scale of production at the plant level. The problem of achieving adequate sacle is

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[1] Professor Bain's study covers the United States, United Kingdom, Canada, France, Italy, Sweden, Japan and India. Thus, Yugoslavia is the first East European country to be compared. In relying so heavily on Bain's work we are aware of its shortcomings both those cited by the author as well as by various reviewers (for example, the review by Gideon Rosenbluth, The American Economic Review, March 1967, 57, pages 300-301). Indeed our own work has uncovered numerous statistical errors in the data for the United States. Granting these criticisms, the basic value of Joe Bain's work in providing a set of comparative statistics for the purpose of further international comparisons is substantial.

[2] Comparisons on the basis of the United Nation's classification scheme used by Bain, are made possible by a special publication of the Federal Bureau of Statistics: "Yugoslav Industry 1963: according to the Recommendations of the World Programme of Basic Industrial Statistics," Statistical Bulletin No. 421, July 1966. This Bulletin is based on a complete census of all private and social sector firms engaged in industry and mining. Of the sixty-six 3-digit industries covered by Statistical Bulletin No. 421, only those twenty-five which correspond to industries treated by Bain are included in this study. These twenty-five cover over fifty-three percent of both total employment and value added in industry and mining.

increased by the fact that the Yugoslav economy has a relatively unimportant foreign sector so that the sales of most enterprises are limited to domestic buyers.[1]

The next few introductory paragraphs compare the size and economic characteristics of Yugoslavia with those of the eight nations selected by Bain. This general orientation to the economy is followed by the most important statistical work of the paper: a disaggregate comparison of the Yugoslav plant size distribution, as measured by employment, with the corresponding results for the eight nations studied by Bain. (Disaggregation is by twenty-five, 3-digit industries.) This international comparison shows Yugoslav industry to have such a strikingly atypical structure that a final section is devoted to the evolution of this structure since 1947, and to a consideration of the effect of policy and institutions upon this evolution.

In terms of population, Yugoslavia, with 19 million people in 1963, is one of the smallest of the nine nations surveyed. It is approximately the same size as Canada, but considerably larger than Sweden (7 million). The estimated per capita gross national product of Yugoslavia at a modified official exchange rate of 1,000 dinars per dollar is $289 per year.[2] Thus, with the exception of

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[1] According to the 1962 input-output table, industry and mining exports, including subsidies, account for twelve percent of gross output and twenty-four percent of value added.

[2] Social Product, according to Yugoslav methodology, has been increased fourteen percent in order to obtain a measure of GNP. An exchange rate of 1,000 is used rather than the official 750 in order to give partial compensation for the existence of special disparity rates.

India, the development level of Yugoslavia, according to per capita GNP, is substantially lower than that of the other nations studied by Bain.

This conclusion concerning the level of development is not altered if we use either the percentage of the work force in manufacturing, or the percentage in the total manufacturing, commerce and services. Table I presents statistics for the nine countries by these two definitions.[1] Although Yugoslavia ranks eight, according to both of these employment criteria, the measure of 15.7 percent for manufacturing alone is surprisingly close to Japan's 17.8. This result reflects the great priority given to heavy industry in the East European countries. In summary, Yugoslavia introduces into Bain's comparisons of industrial structure a small, self-sufficient nation with a comparatively low income level and large industrial sector.

For the past two decades, development strategy has centered on rapid industrialization under the system of Workers Management. The continued success of this strategy requires the efficient production of an expanding list of comparatively high technology products. The question raised by these facts and investigated here, is whether such a strategy is seriously hampered by an inability to achieve adequate plant scale. Whatever the answer, it must be taken to reflect upon both the behavior of Workers Management as an organizational

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[1] According to the 1961 census, there were 9.340 million active people of whom .203 were without an occupation (van delatnosti). Of the 8.127 million with an occupation, .993 are employed in Industry and Mining (Yugoslav definition), and we estimate that another .284 million of those classified as Handicraft should be transferred to Industry and Mining to permit international comparability. The statistics are from the Statisticki Godisnjak SFRY, Savezni Zavod Za Statistiku, Godina XI - Beograd, July 1964, p. 85.

system as well as upon the feasibility of rapid industrialization in small nations generally.

Plant Scale and Efficiency in 1963

The basic data concerning the absolute size of Yugoslav industries is contained in Table II. For twenty-five three-digit industries, a cross classification of the number of firms according to seven sizes of employment categories is given in the first row. The second row gives both total employment and the percentage distribution of employment. Since it is the percentage of employment that is most relevant when comparing economies of radically different size, our principal focus will be upon the second row.

To facilitate a comparison of the size distribution of Yugoslavian employment with other nations, more aggregate summary data is presented in Table III. This Table is based upon a prior aggregation of employment percentages into three size categories corresponding to Small, Medium and Large Plants.[1] Table III shows, by nation and the three plant size categories, the number of industries for which Yugoslavia has a larger portion of that industry's workers in a particular size category than does the country being compared. Thus, in comparing Yugoslavia and the United States, we see that for only seven out of twenty-five industries is the proportion of the industry work force employed in Small Plants in Yugoslavia greater than the corresponding proportion in the United States. On the other hand, for Large Plants sixteen out of twenty-three

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[1] The precise definitions are given in a footnote to Table III.

TABLE I

Population and Employment
in Nine Countries

	Total Population	Total Employment	Work Force in Manufacturing	Work Force in Commerce, Manufacturing and Service
	IN MILLIONS		IN PERCENT	
India	434	139.5	9.0	24.7
United States	179	56.4	26.1	70.4
Japan	93	39.2	17.8	47.7
United Kingdom	53	23.5	40.1	69.0
Italy	50	20.7	21.9	42.3
France	47	19.2	25.8	56.4
Canada	18	5.2	26.0	61.3
Yugoslavia	18	8.1	15.7	26.9
Sweden	7	3.1	31.5	61.5

Sources: Bain, Ibid., pages 12, 14 and 16, and Statistical Bulletin No. 241, p. 85.

industries show higher employment concentrations than in the United States.

Examining the other nations we find consistent evidence that Yugoslavia has an unusually small part of its labor force employed in Small Plants. The range of the observations for different countries is from seven out of twenty-five for the United States to a striking zero out of twenty-four for Japan. Except for the U.S. and the U.K., no nation had more than two industries where its employment percentage in Small Plants is less than Yugoslavia's. Aggregating over all nations and industries we find that for only nineteen out of a possible one hundred and fifty-two comparisons is the Yugoslav measure larger. This ratio of 1:8 clearly differs significantly from the apriori expectation of 1:2 which would be valid if all nations had the same plant size distribution.

Turning next to larger plants, the statistical results are reversed. That is, for sixteen out of twenty-three industries, Yugoslavia has a larger portion of all employment accounted for by Large Plants than does the United States. Even more notable is the fact that this ratio of seventy percent for the U.S. is a minimum value for the eight comparisons made. The maximum value of one hundred percent is found for Canada where for each of twelve industries compared, Yugoslavia has a higher proportion of Large Plant employment. Aggregating over all nations, the Yugoslav industry share is greater in one hundred twenty-one out of one hundred forty-six cases, or eighty-three percent of the time. Again, this percentage is clearly significantly different from the fifty percent suggested by a null hypothesis of equal plant size for all countries.

Table II

Size Distribution of Yugoslav Plants by Number of Workers[a]

Industry	Number of Statistical Units	Number of Workers (in 000's)	1-19	20-49	50-99	100-199	200-499	500-999	1,000 and above
Steel works and rolling mills (341)[b]	18	31,172	-	1	1	3	2	4	7
		100.00		.10	.19	1.30	2.19	10.30	85.92
Nonferrous metals (342)	20	15,684	1	-	1	1	8	2	7
		100.00	.006		.57	.85	17.23	9.51	71.77
Petroleum refining (321)	5	3,594	-	-	1	-	1	1	2
		100.00			2.75		10.33	25.63	61.57
Cement (334)	13	8,703	-	-	-	2	6	2	3
		100.00				3.34	25.52	17.95	53.19
Glass products (332)	80	11,744	68	-	1	1	2	3	5
		100.00	1.11		.81	1.23	6.51	16.60	73.75
Motor vehicles and parts (383)	31	41,819	-	-	3	4	4	5	15
		100.00			.48	1.51	2.89	9.21	85.92
Aircraft		n.a.[c]	n.a.						

[a]The basic statistical unit refers to an enterprise. However, when an enterprise was involved in more than one economic activity, subdivisions were carried out according to the international classification of industries, and the basic statistical unit thus became a plant.

[b]ISIC code.

[c]n.a. indicates that the information is not available as all industries in Yugoslavia have not yet developed to the extent that they may be classified as independent statistical units.

Table II (Continued)

Industry	Number of Statistical Units	Number of Workers (in 000's)	1-19	20-49	50-99	100-199	200-499	500-999	1,000 and above
Shipbuilding (381)	91	21.597	62	3	2	6	9	5	4
		100.00	.52	.49	.30	4.55	12.36	17.01	63.99
Agricultural Machinery	n.a.	n.a.							
Electrical Industrial Equipment (370)	2,207	64,548	2,068	37	23	20	29	16	14
		100.00	4.88	1.88	2.46	4.54	14.63	18.62	52.99
Electric light bulbs	n.a.	n.a.							
Hardware	n.a.	n.a.							
Explosives	n.a.	n.a.							
Plastics	n.a.	n.a.							
Paints and varnishes (313)	15	2,909	-	2	6	3	3	1	-
		100.00		2.37	14.78	12.96	36.20	33.69	
Drugs	n.a.	n.a.							
Soap	n.a.	n.a.							
Tobacco products (220)	76	18,410	1	6	15	25	20	6	3
		100.00	.05	1.16	5.72	18.58	31.38	21.88	21.22
Sawmills and planing mills (251)	2,059	70,064	1,876	16	24	41	55	33	14
		100.00	3.18	.79	2.52	8.64	25.56	31.14	28.17
Wood Containers (252)	1,979	5,048	1,941	14	12	11	1	-	-
		100.00	41.09	9.85	16.52	28.53	4.02		

Table II (Continued)

Industry	Number of Statistical Units	Number of Workers (in 000's)	1-19	20-49	50-99	100-199	200-499	500-999	1,000 and above
Pulp mills (271)	22	12,523	-	-	2	3	7	5	5
		100.00			1.36	3.56	17.68	28.16	49.25
Paper and paperboard (272)	113	4,822	83	8	9	7	3	3	-
		100.00	2.59	5.31	11.68	19.06	20.99	40.38	
Grain products (205)	7,763	26,336	7,623	46	29	39	23	3	-
		100.00	33.42	5.17	7.46	21.92	24.30	7.73	
Sugar refining (207)	13	8,193	-	-	-	-	5	7	1
		100.00					26.45	53.94	19.61
Canned and preserved fruits, vegetables (203)	47	9,618	1	5	9	15	15	1	1
		100.00	.01	1.82	6.60	22.92	51.21	6.18	11.17
Seafood (Canned, packaged, cured) (204)	21	6,509	-	-	7	6	5	1	2
		100.00			7.71	13.49	25.81	8.05	44.94
Breweries and malt (213)	27	4,395		1	7	12	7	-	-
		100.00		1.00	12.88	40.00	46.12		
Distilled liquor (211)	31	3 132	2	10	8	7	4	-	-
		100.00	1.09	10.12	18.45	30.46	39.88		
Textiles: wool and cotton (231)	1 458	109,659	1,279	12	15	34	49	37	32
		100.00	1.39	.36	1.00	4.47	14.51	23.89	54.37

Table II (continued)

Industry	Number of Statistical Units	Number of Workers (in 000's)	1-19	20-49	50-99	100-199	200-499	500-999	1,000 and above
Knitting mills (232)	989	38,665	871	5	14	37	47	11	4
		100.00	3.08	.50	2.58	13.98	39.11	20.25	20.50
Leather tanning (291)	51	10,978	4	4	8	11	20	4	-
		100.00	.36	1.24	7.62	14.17	52.57	25.86	
Apparel (243)	11,508	63,786	11,233	83	55	71	41	14	6
		100.00	21.91	4.63	6.26	15.52	20.29	13.73	19.22
Rubber products (300)	477	13,524	454	2	8	4	3	3	3
		100.00	4.80	.53	4.73	4.05	7.65	20.52	57.71

Source: "Jugoslavenska Industrija 1963. Prema Preporukama Svjetskog Programa Industrijske Statistike," Statistički Bilten 421.

Table III

International Comparison of Proportion of Employees Working in Small, Medium and Large Plants[a]

Nation	Total No. of possible Industry Comparisons	Number of Industries in Which Percentage of Yugoslav Workers Employed is Greater than Comparison Nation: Small Plants	Medium Plants	Large Plants	(Total Number possible)
United States	25	7	13	16	(23)
United Kingdom	24	6	14	14	(20)
Canada	13	2	6	12	(12)
Sweden	23	2	17	15	(18)
France	24	1	16	18	(20)
Italy	23	n.a.	n.a.	15	(18)
Japan	24	0	14	18	(19)
India	19	1	15	13	(16)
Total	175	19	95	121	(146)
Total Possible	175	152	152	146	

Source: Table II and Bain, Ibid., pages 151-182, Tables A-1 to A-8.

[a] "Small Plants" are defined as those plants which employ less than 200 workers. Exceptions to this are the United States, Canada and India where 250 workers is the critical value. "Large Plants" employ 1,000 or more workers. The number of industry comparisons for Large Plants (146) is less than for Small or Medium Plants because in certain cases neither Yugoslavia nor the comparison country had any plants of size 1,000 or larger. "Medium Plants" are of size less than 1,000 but greater than the "Small Plants." The total number of Small and Medium Plant comparisons is 152 rather than 175 because a satisfactory disaggregation is not available for Italy.

The results for the Medium Plant category indicate that the low employment in Small Plants is almost, but not totally compensated for by high employment in Large Plants. For ninety-five out of one hundred fifty-two comparisons (sixty-three percent), the medium size Yugoslav plants employed more workers than did the other nations. This result is close to the expected fifty percent.

The conclusion seems inescapable that with the possible exception of the U.S. and the U.K., the typical Yugoslav plant-size distribution has fewer Small Plants and more Large Plants than other nations. The disparity between the expected and the actual plant size frequencies is both large in absolute value and consistent over nations and industries. There are, however, certain possible sources of statistical bias.

One factor which might cause Yugoslav plants to appear larger is that in some cases the maximum, or open-ended category for the nation being compared to Yugoslavia is not 1,000 and over, but rather some smaller figure, say 500 and over. In this case, we class all the plants for both nations into 500 - 1,000 category although some may be substantially larger. This tends to understate that nations large plants and overstate its medium plants vis a vis Yugoslavia. A direct check of the importance of this bias may be made by defining large plants in terms of the largest open ended category of the nation being compared to Yugoslavia rather than in terms of a fixed value of 1,000. Recomputations made in this manner, however, have very little affect upon the proportion of industries where Yugoslavia has greater Large Plant employment. Specifically, the ratio changes from 121:146 to 123:150. Thus, differences in the definition of the open-ended category do not importantly affect the results.

A related source of bias would be that 1,000 workers is too small a value to use in defining the open-ended category. For example, 86 percent of Yugoslav steel employment and 92 percent of United States steel production occurs in plants of size 1,000 or more. As a consequence, there may be radical differences in plant-size distributions which we are unable to detect without a further division of the open-ended category. To test whether distribution differences within the open-ended category might significantly affect our conclusion, a comparison is made of the average plant size for that category alone.[1] The results confirm the conclusion that the absolute size of Yugoslav firms is large by international standards. For 112 out of 168 possible comparisons, Yugoslavia exhibits larger average plant size in the open-ended category than other nations. Surprisingly, the average size of large plants in Yugoslavia is about equal to that in the United States. This is evidenced by the fact that Yugoslavia has larger values than the U.S. for twelve out of twenty-five industries. The comparatively large size of plants within the open-ended category and the large proportion of plants which fall into that category combine to indicate an unusual distortion in the typical international plant size distribution.

The small size of the Yugoslav economy together with the large size of plants quite predictably produce extremely high plant concentration ratios.[2] To conserve space only one such measure will be presented. Table IV shows, for nine nations, the number of industries in which fifteen or fewer plants account for over one-half of total employment. Eighteen of twenty-five Yugoslav industries satisfy

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[1] In cases where the comparison country has no plants of 1,000 or more workers, or has an open ended category with a smaller cut-off point than 1,000, the Yugoslav data is aggregated to provide consistent matchings.

[2] Lack of data prohibits the computation of <u>enterprise</u> concentration ratios.

Table IV

Plant Concentration

	Number of Industries in which 15 or fewer plants account for over one-half of employment	Total Number of Industries
Yugoslavia	18	25
United States	4	24
United Kingdom	6	23
France	6	22
Japan	7	22
Italy	8	23
Canada	2	8
Sweden	15	22

Source: Table II and Bain, op. cit., p. 54.

this condition. Only Sweden, with less than half the work force of Yugoslavia has such correspondingly high concentration.[1] The magnitude of monopoly power indicated by these statistics poses a serious dilemma for Yugoslav policy makers seeking to shift decision making powers from political bodies to the enterprises.

The foregoing data indicates that a high portion of Yugoslav output is supplied by firms that are large by international standards. This evidence, however, does not show what portion of output is supplied by enterprises of "efficient" scale. To obtain at least a crude measure of comparative efficiency we rely upon Bain. He considers "reasonably efficient scale" to exist if unit costs of production do not exceed the minimum attainable by more than 3 or 4 percent. In addition, he relies on his earlier works to conclude that for most industries 70 to 90 percent of output in the United States, is supplied by firms which satisfy this above definition of efficient. This permits one to define a minimum optimal scale for other nations in terms of the results derived for the United States. To wit, an efficient firm is one which employs at least as many workers as the U.S. firm which lies at the thirtieth percentile. To apply this measure, we compute the percentage of output supplied by firms of efficient size which, by definition, is 70 for the United States and may lie between 0 and 100

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[1] A similar conclusion is reached by Isak Drutter who uses the share of output supplied by the four largest firms as a measure of concentration. For twenty branches of Industry and Mining, Drutter finds that in thirteen cases the Yugoslav branches are more concentrated than those in the United Kingdom, and that in fourteen cases the Yugoslav branches are more concentrated than those in the United States. ""Problemi Privredne Koncentracije", Ekonomski Institut, Zagreb 1964, Table VII, page 51.)

for other nations. In order to minimize the error introduced by the discreteness of size categories, all figures for other nations which are greater than 70 are written as 70.

The results of this calculation for Yugoslavia are presented in Table V and international comparisons are made in Table VI. The conclusion is that for only twenty-four percent of the industries compared does Yugoslavia have a higher proportion of output supplied by inefficiently small firms than does the United States. No other nation in Bain's sample of eight had such a low proportion of inefficiently structured industries. In addition, within the twenty-four percent of the industries classed as inefficient, over half (54 percent) of the total output of these industries is supplied by firms of efficient scale.

Table V

Percentage of Workers Employed in Plants of Efficient Size in Twenty-five Industries in Yugoslavia

Industry	U.S. Size Class which includes 70% of Total Employment	Yugoslavia (US = 70)
Steel works and rolling mills	1000 & above	70
Nonferrous metals	250 & above	70
Petroleum refining	1000 & above	62
Cement	250 & above	70
Glass Products	250 - 499	70
Motor vehicles and parts	1000 & above	70
Shipbuilding	250 - 499	70
Electrical industrial equipment	250 - 499	70
Paints and varnishes	50 - 99	70
Tobacco products	250 - 499	70
Sawmills and planing mills	20 - 49	70
Wood containers	50 - 99	49
Pulp mills	250 - 499	70
Paper and paperboard	250 - 499	61
Grain products	50 - 99	67
Sugar refining	100 - 249	70
Canned and preserved fruits, vegetables	50 - 99	70
Seafood (canned, packaged, cured)	50 - 99	70
Breweries, malt	250 - 499	46
Distilled liquor	250 - 499	40
Textiles: wool and cotton	250 - 499	70
Knitting mills	100 - 249	70
Leather tanning	100 - 249	70
Apparel	50 - 99	70
Rubber Products	500 - 999	70

Table VI

International Comparison of Proportion of Efficient Plants

Country	Number of Industries Counted	Percentage of Number of Industries in Which Less than 70 Percent of Employees Work in Reasonably Efficient Plants	Mean Percentage of Employees Working in Reasonably Efficient Plants, for Industries in which Percentage is Less than 70 Percent
Yugoslavia	(25)	24	54
United Kingdom	(22)	32	54
India	(16)	56	33
Canada	(8)	75	46
France	(20)	75	48
Japan	(23)	78	46
Sweden	(22)	82	48
Italy	(23)	91	42

Source: Table V and Bain, p. 64.

Changes in Enterprise Size Since 1939

Although the data used above is only available for 1963, we can obtain a rough idea of trends in average plant size by examining aggregate statistics for Industry and Mining enterprises.[1] Table VII shows the size distribution of the number of firms and of employment for selected years since 1938. The most notable characteristics of this data are: The great drop in the number of small enterprises between 1938 and 1952; the growth in the importance of medium size firms as employers of labor between 1953 and 1956; and the decline in the importance of both small and medium firms as employers of labor after 1956.

The postwar drop in the number of small firms is a typical concomitant of socialization in Eastern Europe. The expansion of the employment capability of medium firms between 1952 and 1956 is more notable. It appears likely that the

[1] The terms "enterprise" or "firm" are used interchangeably.

advent of Workers Management in 1950 and the decentralization of the economy after 1952, gave a strong impetus to the formation of firms employing from 250 to 1,000 workers. During this period the importance of the Commune as the initiator of new enterprises and government policies favoring investment in non-urban areas favored the creation of firms large enough to warrant the attention of the Communal administration and large enough to supply many of their own supporting services, but not so large as to unduly tax local manpower and capital resources. Also, the excessive expansion of large scale, heavy industry prior to 1952 had as its natural successor a period of equilibrating growth in smaller firms.

The expansion in the importance of large firms after 1956 at the expense of both the small and the medium size groups is, perhaps, the most interesting aspect of the data in Table VII. It is quite remarkable that with industrial output increasing by 180 percent the number of enterprises employing fewer than 1,000 workers decreased from 2,398 to 2,127, while the number of large firms increased from 143 to 338. An inspection of the twenty individual branches of Industry and Mining, however, reveals that most of the decrease in small firms occurs in only two branches, both of which are characterized by relatively small scale operations and a large number of firms: Industrial Construction Materials and Food Processing (Yugoslav classification). Consequently, the typical behavior for other branches is to have rapid increases in output supplied by a fixed number of firms, or at least a slowly increasing number of firms. As this process continues the ranks of small firms are depleted by natural growth and are not replenished by new entrants. This means that the increasingly more complex and diversified output mix in Yugoslavia is being supplied by an essentially fixed set of firms.

Table VII

Changes in the Size of the

Yugoslav Industrial Firm Since 1938

	1938	1952	1956	1960	1963	1965
Number of Employees			Number of Firms			
0-60	1,654	984	798	475	335	282
61-125	432	379	543	499	464	407
126-250	339	276	449	531	581	547
251-500	201	221	379	495	520	542
501-1,000	75	135	229	298	310	349
over 1,000	55	96	143	257	297	338
Total	2,756*	2,091	2,541	2,556	2,507	2,465
			Percentage Distribution of Number of Firms			
Small Firms (0-250)	88	78	70	59	55	50
Medium Firms (251-1,000)	10	17	24	31	33	36
Large Firms (over 1,000)	2	5	6	10	12	14
Total	100	100	100	100	100	100
			Total Employment (in thousands)			
0-60	33	29	24	14	12	10
61-125	40	34	49	45	42	37
126-250	64	52	80	100	105	99

Table VII (continued)

	1938	1952	1956	1960	1963	1965
			Total Employment (in thousands)			
251-500	75	83	139	186	184	193
501-1,000	56	101	171	223	220	247
over 1,000	83	262	282	503	655	780
Total	351	562	745	1,072	1,222	1,366
			Percentage Distribution of Total Employment			
Small Firms (0-250)	39	20	20	15	13	11
Medium Firms (251-1,000)	37	33	42	38	33	32
Large Firms (over 1,000)	24	47	38	47	54	57
Total	100	100	100	100	100	100
			Index of Industrial Production (1952=100)			
	61	100	162	274	363	455

Footnote to Table VII

*A total of 3,110 firms are identified for 1938; however, the size of 454 of these is not known.

Sources

Data on the Number of Firms is taken from Jugoslavija 1945-1964: Statisticki Pregled, Savenzi Zavod za Statistiku (Beograd) November 1965, p. 143 for the years, 1938, 1952, 1960 and 1963 and from Statisticki Bilten, Broj 81, p. 5 for 1956, and Statisticki Bilten, Broj 442, p. 37 for 1965. Data on Total Employment is taken from the above Biltens for 1956 and 1965, from Statisticki Bilten, Broj 351, p. 54 for 1963; and for the years 1952 and 1960 it is estimated from the statistics on the number of firms and a series on total employment in Industry and Mining obtained from Statisticki Bilten, Broj 310, p. 11 and Statisticki Pregled, p. 142. The employment estimates for 1938 are obtained

by multiplying the number of firms in the smallest category by 20, in the largest category of 1,500 and in the other categories by the arithmetic mean of the employment limits in those categories. The Index of Industrial production is from Statisticki Pregled, p. 142.

CONCLUSIONS

From the 1963 plant evidence there can be little doubt that the distribution function for Yugoslav plant size has a pronounced tendency towards relatively low small plant values and relatively high large plant values. The only exceptions to this are Tobacco, Wood, Paper and Grain. There are industries which were important in the pre-war economy and which (with the exception of Tobacco) still have significant amounts of small scale, private sector employment. They are also sectors which have been relatively unimportant in the post-war expansion. From the time series evidence on the size distribution of enterprises we may conclude that the trend is towards an even more lopsided plant size distribution. Barring a wave of small enterprise formation (which seems quite unlikely when we note that the 1965 Economic Reform and subsequent policy seek to increase the investible funds of existing enterprises at the expense of government financed investment) further increases in average plant size can be anticipated.

The unusually large plant scale is a result both of conscious government policy and of certain natural tendencies of the institutional system. The feeling that there are important economies to be recognized by larger scale production continues to be reflected in the statements of policymakers.[1]

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[1] For example, the following remark by President Tito at Pristina, March 26, 1967. "The Economics Reform provides for their (the enterprises) integration, thus increasing the volume and reducing the cost of their production, as otherwise we cannot enter international markets." Yugoslav Facts and Views No. 21, April 13, 1967, (Yugoslav Information Center, N.Y.,N.Y.) page 4.

Such statements, however, typically refer to integration at the enterprise level and it is not clear whether concentration is expected to reduce costs because of scale economies at the plant level or because of the elimination of duplication in ancillary activities such as administration and sales. Most likely reductions in costs from both sources are expected. In any event, increases in the scale of enterprises has been a direct object of government policy. There are, however, other possible causes of large plant size besides direct concern with scale economies. A commonly recognized problem in developing countries is the shortage of high level decision making ability.[1] Organization of the economy into a relatively small number of large firms may be viewed as a perfectly rational method of hoarding this scarce resource. However, after twenty years of rapid growth, and presumably a substantial increase in the number of qualified managers and administrators, it is difficult to associate the continuing decline in the number of firms with this cause.

Large and growing plant sizes may also be related to the spatial distribution of enterprises in Yugoslavia. Both in order to foster the economic development of the more backward southern areas of the country and in order to reduce the demands for urban social overhead capital, an important aspect of government policy has been to locate plants in rural areas. (A surprising forty percent of the non-agricultural work force lives in agricultural households.) This has meant that such plants need to provide many of their

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[1] For a discussion of this point see A. O. Hirschman's, The Strategy of Economic Development. Yale University Press, New Haven, Conn., 1958.

own service and maintenance facilities, thereby increasing the average plant size. To some extent this is not so much a cause of large plant size as it is a discrepancy between the theoretical concept of a plant and its empirical measurement. Unfortunately, we have no evidence on the extent to which this type of vertical integration within plants varies from country to country. It is most likely, however, that the spatial diffusion of plants in Yugoslavia increases the need for vertical integration and, consequently the size of plants.

It is also tempting to relate large plant size to the problems of founding a new firm under the system of Workers Management. During the period from 1952 to 1965 the great majority of new firms were initiated either by the local Communes or by the Federal Government.[1] It seems likely that such bureaucratic bodies would incline towards establishing a few large scale projects rather than numerous small scale projects. This conclusion is reinforced by the fact that most Yugoslav enterprises are one or two plant operations[2] so that factors affecting firm formation are

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[1]For example, by themselves, the ninety "key projects" (kljucni objekti) initiated by the Federal Government between 1952 and 1957 accounted for eighteen percent of total industrial production by 1957. "Osnovni Podaci o Udelu Novih Preduzeca u Industriji od 1952 do 1957" (basic Facts about the Participation of New Enterprises in Industry from 1952 to 1957) Studije i Analize, Broj 11, p. 12, March 1959, Savezni Zavod Za Statistiku.

[2]If we exclude Handicraft shops, there are 2,507 industry and mining enterprises (Statisticki Bilten 351, p. 10) and approximately 3,300 industry and mining plants. This latter figure is obtained by deducting an estimated 87,000 private sector Handicraft plants and 2,000 social sector Handicraft plants from the 92,295 plants covered in Statisticki Bilten 421. These deductions are obtained from the 1966 Statisticki Godisnjak pages 184 and 186.

directly related to the plant size distribution.

Until further research is performed, only speculations of the above type may be made concerning the causes of the unusual plant size distribution found in Yugoslavia. The distribution itself, however, suggests that continued emphasis on the non-selective integration of firms may be misguided. There are clearly only limited gains in scale economies to be achieved from such action. This is not to deny that there are certain industries which are still subject to substantial economies of scale,[1] nor that although such economies may be small in a particular branch, that small gain may be critical in expanding exports. However, we do show that the existing scale of operations in most industries is so large by international standards that the reasons for comparatively low labor productivity must be sought elsewhere. Indeed, one might speculate that the absence of small plants in some areas is itself a direct contributor to low productivity. Whatever its affect on productivity the formation of more small firms would certainly help to reduce the high industry concentration ratios that currently exist in Yugoslavia.

Our results also have possible implications for theories of the Socialist Economy. One of the most disturbing characteristics of Professor Ward's static model of the Illyrian economy (a stylized version of Workers Management in Yugoslavia) is the negatively sloped supply curve for the

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[1] Passenger automobiles are one example. The largest Yugoslav producer, "Zastava" has an annual output of 50,000 units while an efficient scale is estimated to be 200,000 or 300,000. (Sergije Lukac, "The Yugoslav and His Car." Review: Yugoslav Monthly Magazine, September, 1967, page 30.)

firms output.[1] This result leaves one with the uncomfortable feeling that an economy with Illyrian type organizations may be faced with a withering of the firm as development occurs and demand curves shift outwards. The extremely rapid growth and consolidation of enterprises which we find suggests that this perversity is not an important, dynamic problem of the Yugoslav system.

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[1] Ward, Benjamin, The Socialist Economy, (Random House: New York, 1967) p. 192.