REGIONAL BUSINESS CYCLES IN YUGOSLAVIA

*Tea PETRIN**)

I. Introduction

This study investigates regional cyclical fluctuations in Yugoslavia as experienced in the period after World War II. It centers around five hypotheses which explore in the main the causes of regional business cycles, their relation to the long term growth patterns, and the regional transmission of the cycles. The testing of the hypotheses was based on industrial output for the six republics for the period between 1952 and 1971.[1])

In order for regional policy to reflect the conditions and needs of the regions, it is necessary to introduce a spatial dimension into the concept of economic structure of the nation and into the study of endogenous variables commonly connected with cyclical behavior. Recent studies of regional business cycles have shown that some significant differences exist between regional and national business conditions, and that it is incorrect to assume that study of national cycles will reveal all the characteristics of regional cycles.

The reasons for studying regional business cycles in Yugoslavia are several. Yugoslavia is a multinational state, consisting of six ethnically and culturally distinct republics. Because of their political and administrative autonomy and because of differences in their economic structure it is common to regard the republics as economic regions. For some purposes, and when data is available, Serbia Proper, Vojvodina, and Kosovo, have been treated as separate regions, increasing the number of economic regions to eight. In this study Serbia will be treated as a single economic region making a total of six.

If either timing, duration, or amplitude of the republics' cycles differs from the national cycle, it follows that anticyclical policy undertaken on the republic level must differ from that on the national level. The trend toward further decentralization of federal authority and the transfer of fiscal functions from the federal level to the republics leads one to expect that the authorities of individual republics will become increasingly responsible for implementing anticyclical policies.

*) Assistant, Faculty of Economics, Ljubljana.

[1]) This article is based on the M. A. thesis (Louisiana State University, New Orleans, 1971), where all the tests of the hypotheses were based on industrial output for the six republics for the period between 1952–1968. In this article, the change was made in testing the hypotheses so that the same data was extended into the year 1971.

Therefore, it would be in the interest of the various republics' authorities to know to what extent the regional cycles differ from the national and to predict their timing, duration, and amplitudes. The specific knowledge of cyclical fluctuations would then enable the authorities to undertake appropriate policy decisions on the republic level. That in turn would improve the corrective actions for the economy as a whole. Should the research indicate that there are wide differences in variability among republics, then the republic with the greater variability would have to give particular attention to anticyclical policy.

II. Hypotheses to be Tested

The hypotheses were developed on the basis of the current literature dealing with the question of regional business cycles. Three problems of regional bussiness cycles which have been dealt with in the literature can be classified in three groups. The first group deals with the causes of regional business cycles,[2]) the second deals with the regional transmission of the cycle,[3]) and the third group deals with the relation of the regional cycle to the long-term growth pattern.[4])

The tests of regional business cycles in Yugoslavia center around the following five hypotheses which are related to the three problems of regional business cycles mentioned above:

1. Long-lasting differences in cyclical fluctuations among republics exist.
2. These differences are partly a result of the differences in industry mix.
3. Growth trends have an important influence on the cyclical variability. High-growth rates and mild cyclical fluctuations are found more frequently than the opposite.
4. Republics that experience retardation in growth relative to the other republics tend to show larger cyclical fluctuations than the republics that experience acceleration in growth
5. The national cycle is transmitted through the major exporting industry of a region. Therefore, cyclical impulses of the main

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[2]) See for example: G. H. Borts, »Regional Cycles of Manufacturing Employment in the United States, 1914—1953.« (New York: National Bureau of Economic Research Occasional Paper 73, 1960); P. Neff and A. Weifenbech, *Business Cycles in Selected Industrial Areas* (Berkeley and Los Angeles: The University of California Press, 1949); H. Richardson, *Regional Economics* (New York: Praeger Publishers, 1969); A. R. Siegel, »Do Regional Business Cycles Exist?«, *Western Economic Journal*, V (December, 1966); M. Bazler—Madžar, »Regionalni aspekt privrednih ciklusa u Jugoslaviji,« *Ekonomska analiza*, 3—4 (1969).

[3]) See for example: H. Richardson, *Regional Economics* (New York: Praeger Publishers, 1969); G. H. Borts, »Regional Cycles of Manufacturing Employment in the United States, 1914—1953,« (New York: National Bureau of Economic Research Occasional Paper 73, 1960).

[4]) See for example: C. Steiner, »Discussion of Interregional Variations in Economic Fluctuations,« *American Economic Review*, XXXIX (May, 1949); W. Mitchell, *What Happens During Business Cycles* (New York: National Bureau of Economic Research, 1951).

A more detailed survey of the literature can be found in T. Petrin, »Regional Business Cycles in Yugoslavia« (Unpublished M.A. Thesis, Louisiana State University in New Orleans, 1971).

local industry of a region will be derived from the impulses the export industries receive from the national and international markets.

The first of the hypotheses relates to the existence of the regional business cycles, the second relates to the causes of regional business cycles, the third and the fourth hypotheses explore the relation of regional business cycles to the long-term growth patterns, while the fifth hypothesis deals with the problem of regional transmission of the cycles.

III. Data and Methodology Used in Testing the Hypotheses

Regional business cycles are measured by the indexes[5]) of industrial output. The period used is from 1952—1971. The data has been obtained from *Indeks*, the publication of the Yugoslav Statistical Office.

To compute the cycles, the relative changes in growth rahter than differences between absolute data is used. In terms of mathematics the analysis deals with the logarithms (function derivatives) instead of with the function. This method was developed by Horvat[6]) and was later used by Madžar[7]) and Pfajfar[8]). The use of relative changes is important for national economies in which practically no absolute decline in activity and thus no classical depressions have occurred. In a rapidly growing economy the cyclical mechanism, the accelerator, reacts to the changes in growth rates and not simply to absolute changes.[9])

In this analysis the cycle is measured from one point of inflection to the next point of inflection. The measurement from one point of inflection, to another was also used by J. Schumpeter. In his model the point of inflection represents the point of economic equilibrium from which the innovation impulses push the system upwards.[10]) In this analysis the measurement from one point of inflection to another corresponds to the measurement of the cycles from peak to peak in the case of absolute data.

The growth cycle has six stages: (1) depression, (2) trough, (3) revival, (4) boom, (5) peak, and (6) recession.

A cycle starts with depression. The first three stages lie below the trend and the last three above the trend. The decreasing part of the cycle is called the retardation phase and consists of recession and

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[5]) The index of industrial output is based (a) on the monthly production data by products reported by industrial firms, and (b) on weighted coefficients derived from depreciation and gross personal income. The weights are revised yearly.

[6]) B. Horvat, *Privredni ciklusi u Jugoslaviji* (Beograd: Institut ekonomskih nauka, 1969), 25—34.

[7]) M. Bazler-Madžar, »Regionalni aspekt privrednih ciklusa u Jugoslaviji«, *Ekonomska analiza*, 3—4 (1969), 260—74.

[8]) L. Pfajfar, »Cikličnost stopenj rasti industrijske proizvodnje in zaposlenih v industriji Slovenije 1952—1969«, *Ekonomska revija*, 3 (1969), 290—305.

[9]) B. Horvat, »Priiredni ciklus u Jugoslaviji,« *Ekonomist*, 1—4 (1969), 79.

[10]) J. Schumpeter, *Business Cycles* (New York: McGraw-Hill Co., 1939), 210.

depression. The increasing part of the cycle is called the acceleration phase and consists of the revival and boom. Trough and peak correspond to points where the change in the direction of movement occurs. For this reason both peak and trough show the special situation in the economy which is theoretically and practically the main problem of business cycles.

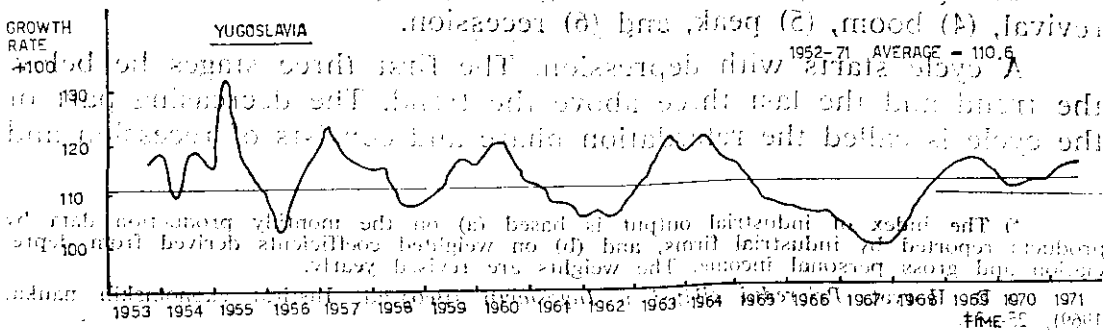
IV. Empirical Results

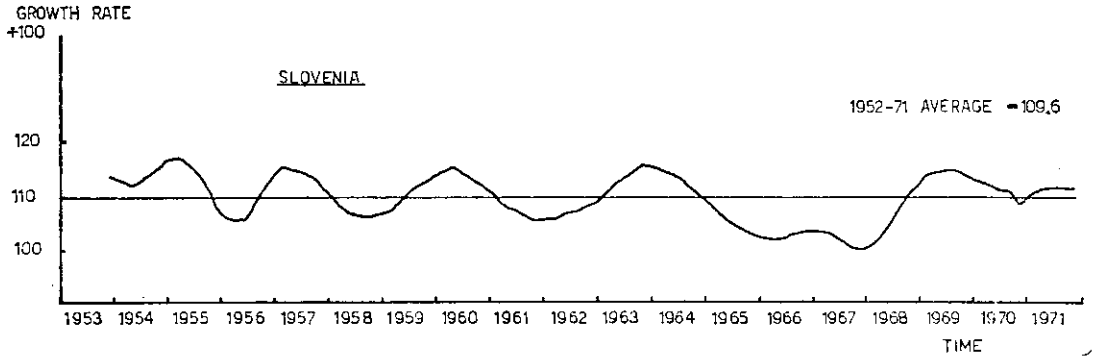
Hypothesis I: Long-lasting differences in cyclical fluctuations among the republics exist. Computations were made to measure cyclical performance and variability.

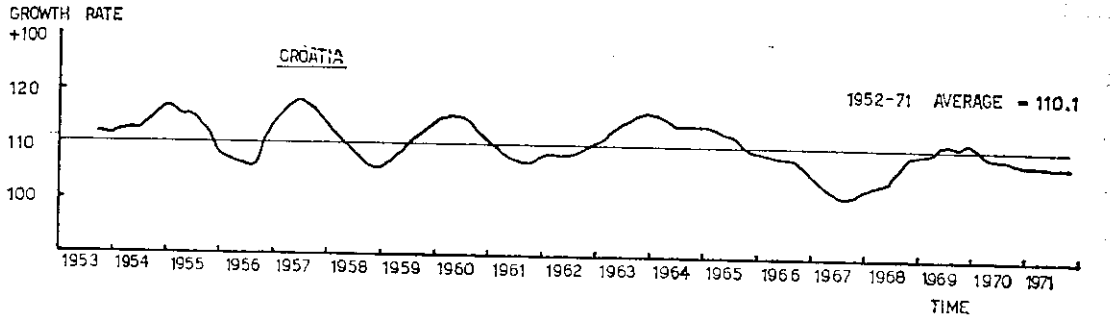
Cycles for six republics are given in Figure 1. They are measured from the trend which is indicated by the horizontal line which represents the average growth rate for the period under consideration. The dating of the cycle is determined by the point at which the line of average growth rate (trend) and the line of the quarter rates are equal.

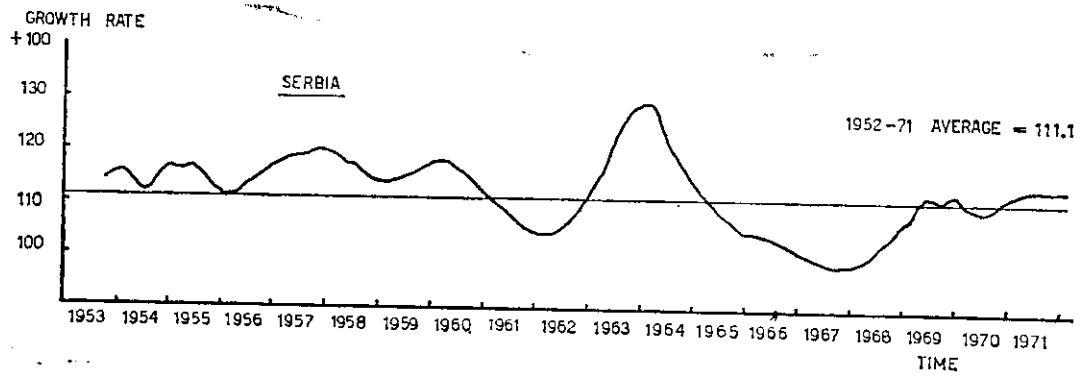
Since cycles are based on growth rates of industrial output computed from the quarterly data, the seasonal variations are eliminated because the same parts of the year are compared. The changes shown are yearly because the ratio is based on successive years. Irregular variations were eliminated by computing the moving averages from four quarter chain indexes.

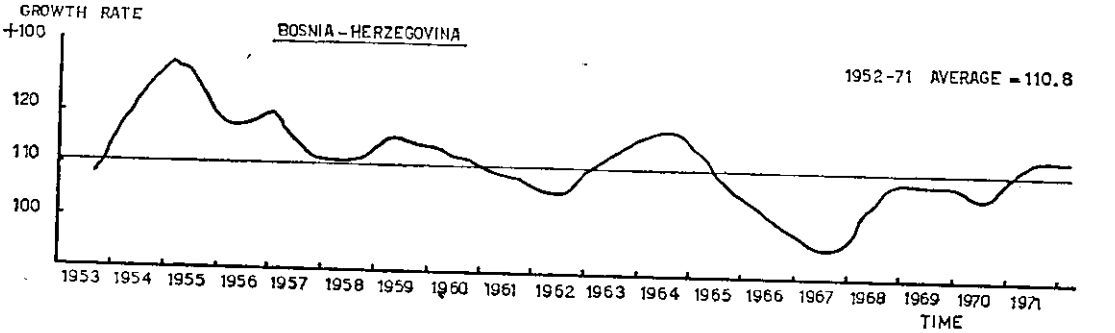
FIGURE 1: CYCLES OF INDUSTRIAL OUTPUT FOR YUGOSLAVIA AND ITS SIX REPUBLICS, 1952—1971

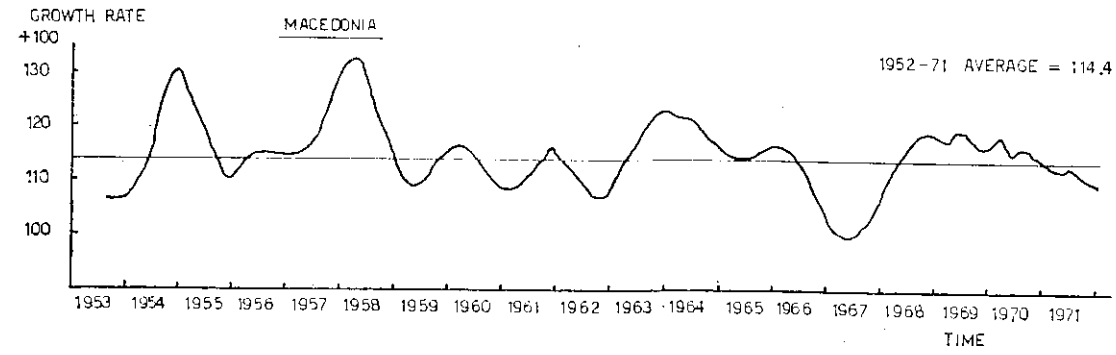


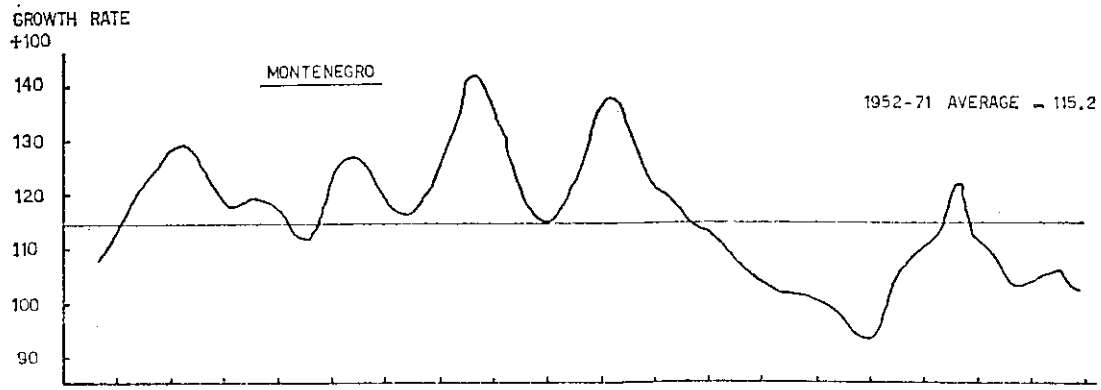

GROWTH RATE
+100
SLOVENIA
1952-71 AVERAGE = 109.6
120
110
100
1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971
TIME


GROWTH RATE
+100
CROATIA
1952-71 AVERAGE = 110.1
120
110
100
1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971
TIME


GROWTH RATE
+100
SERBIA
1952-71 AVERAGE = 111.1
130
120
110
100
1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971
TIME


GROWTH RATE
+100
BOSNIA-HERZEGOVINA
1952-71 AVERAGE = 110.8
120
110
100
1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971
TIME





SOURCE: SEE TABLE 1.

From Figure 1, it is evident that there were five cycles on the national as well as republic levels, with the exception of Serbia, Montenegro, and Bosnia-Herzegovina. Because the data does not exist for the years before 1952, only the second half of the first cycle is shown. At the other extreme the data reach into the current sixth cycle.

If the cyclical behavior of chain indexes of industrial output in Yugoslavia is compared with that in the six republics separately, great similarity is found between the Yugoslav cycles and the cycles of Slovenia and Croatia. The pattern of these three cycles is very similar.

On the other hand, the cyclical behavior of Montenegro and Macedonia shows less similarity to the Yugoslav cycle than in the case of Slovenia and Croatia. During the period of the third national cycle, Macedonia experienced two small subcycles, while the fifth Montenegrin cycle shows a negative growth rate in all quarters of 1967 and in the first quarter of 1968, which was observed in neither of the other republics' or Yugoslav cycles.

Cyclical behavior of Serbia is like that of Bosnia-Herzegovina and both are similar to the national cycle.

The characteristics of both is that only the dates for the fourth and the fifth cycle can be set by the method used in this analysis. To help explain this, the national cycle was taken as reference cycle and the dating of the national cycle was given to both the republics' cycles.

A similar phenomenom is found in Montenegrin cyclical behavior. Here, only the dates for the first and the fifth cycle period can be determined.

Timing is measured by the number of quarters by which troughs and peaks of a republic's cycle precede or follow troughs and peaks of the Yugoslav cycle.

Timing of the Slovenian cycles shows a great coincidence with the timing of the Yugoslav cycles. Peaks and troughs in the second and third cycle occurred at the same time as on the national level. Such similarity is also noticeable in Croatia. The republics which show the smallest coincidence with the timing of the Yugoslav cycles in order are Macedonia, Montenegro, Serbia, and Bosnia-Herzegovina.

The acceleration and retardation phases of individual republics differ not only among republics' cycles but also among the fifth cycle of individual republics. The phase of acceleration is the time interval measured from the date of the initial trough to the date of the peak while the phase of retardation refers to the interval from the peak to the terminal trough.

From Table 1, it is evident that on the average the acceleration phase was longer than the retardation phase of individual cycles. The retardation phase was longer than the acceleration phase only in the fourth cycle in Bosnia-Herzegovina and Serbia, and was longer in the second cycle in Montenegro and Croatia. The length of the acceleration phase was increasing from cycle to cycle. The greatest acceleration phase occurred from the third to the fourth cycle. It was longer in Bosnia-Herzegovina and Croatia than in the other republics.

Another interesting fact is a tendency of lengthening of the retardation phase from cycle to cycle. The retardation phase appeared to be exceptionally long in the fifth cycle, and dropped significantly in length in the six cycle.

The following conclusions can be drawn at this point: first, in the timing of cycles of industrial output Slovenia and Croatia do not differ significantly from Yugoslavia. Lags and leads are no greater than two quarters. Timing in the other four republics (Bosnia-Herzegovina, Montenegro, Macedonia, and Serbia) shows a much greater divergence from the Yugoslav cycle. Because these republics belong to the group of underdeveloped regions, it can be concluded that predicting cyclical behavior of underdeveloped republics from the Yugoslav cycle will be less successful than in the case of developed republics (Slovenia and Croatia). Second, the acceleration phase on the average exceeds the retardation phase but there is a tendency of lengthening of the retardation phase. Third, the short retardation phase in the second Yugoslav cycle was a result of a substantial acceleration in Macedonia and Serbia at that time. Fourth, the length of cycles increases through time.

The variability of the republics' cycles is measured by the cyclical amplitude, the rate of cyclical acceleration, and by the rate of cyclical retardation.[11])

[11]) The annual amplitude is obtained as a weighted geometric mean computed from the acceleration and retardation rates. The retardation rate is computed as a ratio between peak and initial trough, while the acceleration rate is computed as a ratio between peak and terminal trough.

TABLE

CYCLES OF INDUSTRIAL OUTPUT FOR YUGOSLAVIA

Region		Cycle Period	Length in Years	Dates of Cyc Peak
Yugoslavia	1.	III/1955		I/55
	2.	III/1955—I/1958	2.50	I/57
	3.	I/1958—IV/1960	2.75	II/60
	4.	VI/1960—I/1965	4.25	I/64
	5.	I/1965—I/1970	5.00	II/69
	6.	I/1970		
Bosnia-Herzegovina	1.	III/1955		I/55
	2.	III/1955—I/1958	2.50	IV/56
	3.	I/1950—IV/1960	2.75	II/59
	4.	IV/1960—I/1965	4.25	II/64
	5.	I/1965—I/1970	5.00	IV/69
	6.	I/1970		
Montenegro	1.	III/1955		
	2.	III/1955—I/1958	2.50	II/58
	3.	I/1958—IV/1960	2.75	III/60
	4.	IV/1960—I/1965	4.25	I/63
	5.	I/1965—I/1970	5.00	III/69
	6.	I/1970		
Croatia	1.	IV/1955		1V/54
	2.	IV/1955—I/1958	2.25	II/57
	3.	I/1958—IV/1960	2.75	I/60
	4.	IV/1960—II/1965	4.50	IV/63
	5.	II/1965—I/1970	4.75	II/69
	6.	I/1970		
Macedonia	1.	III/1955		IV/54
	2.	III/1955—IV/1958	3.25	I/58
	3.	IV/1958—I/1962	a.1.50	I/60
	4.	I/1962—II/1966	b.1.75	IV/61
	5.	II/1966—I/1971	4.25	IV/63
	6.	I/1971	4.75	IV/68
Slovenia	1.	III/1955		I/55
	2.	III/1955—IV/1957	2.25	I/57
	3.	IV/1957—I/1961	3.25	II/60
	4.	I/1961—IV/1964	3.75	IV/63
	5.	IV/1964—IV/1970	6.00	II/69
	6.	IV/1970		
Serbia	1.	III/1955		II/55
	2.	III/1955—I/1958	2.50	IV/57
	3.	I/1958—IV/1960	2.75	IV/59
	4.	IV/1960—I/1965	4.25	IV/63
	5.	I/1965—I/1970	5.00	II/69
	6.	I/1970		

Source: Computed from original data appearing in the *Index,* various mon

1.

AND ITS SIX REPUBLICS, 1952—1971

Republics' les	Timing at Yugoslav Peak		Timing at Yugoslav Trough		Duration of Cyclical Movements	
Trough	No. of Quarters Lead (—) or Lag (+)	Date of Yugoslav Peak	No. of Quarters Lead (—) or Lag (+)	Date of Yugoslav Trough	Acce-lera-tion	Retar-da-tion
		I/55				
I/56	0	I/57	0	I/56	4	4
III/58	0	II/60	0	III/58	7	6
I/61	0	I/64	0	I/61	12	3
III/67	0	II/69	0	III/67	8	14
II/70	0			II/70		4
	0	I/55				
I/56	—1	I/57	0	I/56	4	5
I/58	—4	II/60	—2	III/58	5	5
I/62	+1	I/64	+4	I/61	9	11
II/67	+2	II/69	—1	III/67	15	13
				II/70		
		I/57	+5	I/56	4	8
II/58	+5	II/60	+2	III/58	6	3
I/59	+1	I/64	+3	I/61	5	5
IV/61	—4	II/69	+1	III/67	7	19
IV/67	+1		+5	II/70		8
III/71						
	—1	I/55				
II/56	+1	I/57	+1	I/56	4	6
III/58	—1	II/60	0	III/58	6	5
III/61	—1	I/64	+2	I/61	9	6
II/67	0	II/69	—1	III/67	8	14
IV/70			+2	II/70		6
	—1	I/55				
IV/55	+4	I/57	—1	I/56	9	4
II/59	—1	II/64	+3	IV/58	3	5
V/60	+6	II/60	+9	IV/58	6	3
II/62	—1	I/64	+5	I/61	7	2
II/67	—2	II/69	—1	III/67	6	14
III/71			+5	II/70		11
	0	I/55				
I/56	0	I/57	0	I/56	4	4
III/58	0	II/60	0	III/58	7	6
IV/61	—1	I/64	+3	I/61	8	6
III/67	0	II/69	0	III/67	7	15
IV/70			+2	II/70		6
	0	I/55				
IV/55	+3	I/57	—1	I/56	8	2
IV/58	—2	II/60	+1	III/58	4	4
I/62	—1	I/64	+4	I/61	7	9
II/67	+1	II/69	+1	III/67	6	16
II/70			+0	II/70		4

thly issues, 1952—1971 (Beograd: Savezni zavod za statistiku, 1952—1971).

TABLE 2.

ANNUAL CYCLICAL AMPLITUDES IN YUGOSLAVIA AND ITS SIX REPUBLICS, 1955—1970

Republic	1955—1958 Percent	1958—1960 Percent	1960—1965 Percent	1965—1970 Percent	Average Republic Variabiilty Rank
Bosnia-Herzegovina	6.00 (6)	7.34 (4)	17.04 (3)	5.95 (6)	4.75
Montenegro	11.45 (2)	23.29 (1)	32.89 (1)	22.96 (1)	1.25
Croatia	10.98 (3)	7.92 (3)	11.46 (4)	6.44 (5)	3.75
Macedonia	21.60 (1)	6.47 (5)	11.30 (5)	13.37 (2)	2.75
Slovenia	9.18 (4)	8.97 (2)	9.78 (6)	8.41 (3)	3.75
Serbia	6.37 (5)	4.40 (6)	22.37 (2)	7.88 (4)	4.25
Yugoslavia	15.26	11.89	17.28	8.86	
Mean Cyclical Amplitude	10.93	9.73	17.47	10.83	
Variance	32.46	46.50	79.06	42.24	
Standard Deviation	5.70	6.82	8.89	6.50	
Coefficient of Variation	.52	.70	.51	.60	

Source: See Table 1.

Table 2 shows annual amplitudes during the second, the third, the fourth, and the fifth cycle. The annual amplitude is not computed for the first cycle because the acceleration rate is not known, nor for the current sixth cycle which is still in progress. The number following the amplitude is the rank of the republic in order of severity during that cycle, the largest amplitude receiving rank 1. The mean cyclical amplitude, the variance of cyclical amplitudes and the coefficient of variation (ratio of the standard deviation to the mean) for each cyclical measure are also shown in Table 2. The coefficient of variation is the greatest for the fifth cycle while the mean cyclical amplitude is the greatest in the fourth cycle. The decrease of the coefficient of variation in the fourth cycle can probably be explained by the shift in industrial composition of the republics. Republics that formerly were specialized in highly cyclical industries have apparently become more diversified industrially.

Because cyclical amplitudes are nearly consistently greater for some republics than for others, the test of the stability of ranking was computed,

The Spearman coefficient of correlation[12]) for the four cycle periods was computed and tested for significance.

The obtained coefficients were statistically insignificant at an acceptable level of confidence, except for the rank correlation between the first and the fifth cycle. The coefficient was significant at .1 level of confidence.

Also, the test of the stability of the rank ordering of the republics' acceleration rates and retardation rates was performed by computing the Spearman rank correlation coefficient. In both cases, the rank correlation coefficients for four pairs of cycles were statistically insignificant. Again, there is one exception. The coefficient obtained from the rank correlation between the third and the fourth cycle period is statistically significant at .1 level of confidence.

Whether the republics with large retardation rates also had large acceleration rates was tested by computing the Spearman rank correlation coeffficients between retardation and acceleration rates.

The obtained coefficients were significant at the .1 and .01 confidence level. Coefficients indicate that the above hypothesized relationship exists and that it becomes stronger from cycle to cycle.

On the basis of the tests of the stability rankings of actual amplitudes, acceleration and retardation rates, the hypothesis that there are no long lasting differences in the cyclical amplitudes cannot be rejected. Therefore, the alternative hypothesis that there are significant differences in cyclical amplitudes cannot be accepted.

Hypothesis II: Differences in cycle amplitudes among the republics are mainly a result of the differences in industry mix found in each republic.

To test this hypothesis, hypothetical cycles were computed so that industry mix was the same for all republics.

The hypothetical cycle for each republic was computed by weighting the national time series of physical output by the republics' industry output shares. For this purpose the following weights were used: for the first cycle the 1954 weights, for the second cycle the 1957 weights, for the third cycle the 1959 weights, for the fourth cycle the 1963 weights, and for the fifth cycle the 1967 weights.

The hypothetical amplitude was computed from an index of hypothetical output. The index was formed through weighting the cyclical experience of each national industry by the relative importance of the industry in each republic. By the relative importance of the industry is meant its share in the nation's industry output.

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[12]) Spearman rank correlation coefficient, called rho, measures the correlation between the two ranks. It can have a value from 1 to —1. A rho 1 or —1 indicates perfect correlation between the two ranks, and a zero or near zero value of rho indicates low correlation between ranks.

Table 3 presents the hypothetical cyclical amplitudes for each republic. They are computed for each cycle for which an actual amplitude is shown in Table 2. In Table 3, the number next to each hypothetical amplitude shows the rank of the republic's amplitude during a single cycle. Also shown are the mean, variance, standard deviation, and coefficient of variation for each cycle.

TABLE 3.

HYPOTHETICAL ANNUAL CYCLICAL AMPLITUDES IN THE SIX REPUBLICS, 1955—1970

Republic	1955—1958 Percent	1958—1960 Percent	1960—1965 Percent	1965—1970 Percent	Average Republic Rank
Bosnia-Herzegovina	5.73 (6)	32.16 (1)	12.61 (4)	8.33 (5)	4.00
Montenegro	8.44 (4)	8.88 (6)	12.01 (5)	7.20 (6)	5.25
Croatia	8.50 (3)	12.62 (3)	13.82 (1)	11.58 (2)	2.25
Macedonia	14.76 (1)	14.91 (2)	11.34 (6)	8.52 (4)	3.25
Slovenia	8.80 (2)	11.38 (5)	13.39 (3)	11.99 (1)	2.75
Serbia	7.23 (5)	12.38 (4)	13.49 (2)	10.26 (3)	3.50
Mean Cyclical Amplitude	8.91	15.39	12.78	9.65	
Variance	9.51	71.33	.93	4.65	
Standard Deviation	3.08	8.45	.96	2.16	
Coefficient of Variation	.35	.55	.08	.22	

Source: See Table 1.

Examination of the coefficient of variation of hypothetical amplitudes indicates that the coefficient of variation is lower than that of the actual amplitudes.

The test of stability of rankings of the hypothetical amplitudes was performed by computing the Spearman rank correlation coefficient. The obtained coefficients were statistically insignificant.

In order to accept the alternative hypothesis that the differences in cycle amplitudes among republics are mainly a result of the differences in industry mix found in each republic, two conditions must be met. First, the distribution of hypothetical amplitudes must bear a closer relation from cycle to cycle than actual amplitudes, and second, the variance of hypothetical amplitudes must be less than the variance of actual amplitudes.

In this case the first and the second condition are met in the second, the fourth, and in the fifth cycle. Therefore, we can reject the null hypothesis that there is no industry mix effect. The results obtained

indicate that cyclical variability was affected by industrial composition in the second, fourth, and fifth cycle. However, the industry which was the most variable in one cycle was not the most variable in the second or third cycle. There is only one exception which is found for the fourth and the fifth cycle period. The positive rank correlation coefficient is significant at .1 confidence level. In all other cases the negative rank correlation coefficient of industry amplitudes supports the former explanation.

The conclusion is that there is an indication that industry mix is present, but it cannot be said that a republic will be constantly more variable from cycle to cycle than others due to the industry-mix effect found in individual republics.

Hypothesis III: The combination of (a) high growth rates and wide cylical fluctuations, and (b) low growth rates and mild cyclical fluctuations are found more frequently than their opposite.

Test. The hypothesis was tested by computing the net amplitude. The net amplitude is the ratio between the actual amplitude over the hypothetical amplitude. Because this measure eliminates the national cyclical impulses filtered through the industry mix it enables us to determine whether the amplitude is related to the growth on the republic level alone.

TABLE 4.

RATIOS OF ACTUAL TO HYPOTHETICAL CYCLICAL AMPLITUDES FOR THE SIX REPUBLICS, 1955—1970

Republic	1955—1958 Index	1958—1960 Index	1960—1965 Index	1965—1970 Index
Bosnia-Herzegovina	100.26 (5)	81.22 (6)	103.93 (3)	71.43 (4)
Montenegro	102.78 (2)	113.23 (1)	118.64 (1)	318.88 (1)
Croatia	102.29 (3)	95.83 (3)	97.93 (5)	55.61 (6)
Macedonia	105.96 (1)	92.66 (5)	99.96 (4)	156.92 (2)
Slovenia	100.35 (4)	97.83 (3)	96.82 (6)	70.14 (5)
Serbia	99.20 (6)	92.89 (4)	107.82 (2)	76.80 (3)

Source: Calculated by the author from the data appearing in Table 3 and Table 2.

Table 4 shows the net amplitudes. The number next to the net amplitude is the republic's rank order, the greatest net amplitude receiving rank 1. A net amplitude in excess of 100 means that the actual amplitude was greater than the hypothetical amplitude and the opposite for the net amplitudes less than 100.

The growth-amplitude relation was measured for the time intervals which preceded, coincided with, or followed a particular cycle. In all cases trends are computed as a geometric mean of actual values.

TABLE 5.

RELATION BETWEEN GROWTH AND AMPLITUDE FOR THE SIX REPUBLICS, 1952—1971

Cycle Period	Trend Period	Mean Ranks			
		Actual Amplitude		Net Amplitude	
		Fast Growing Republics	Slowly Growing Republics	Fast Growing Republics	Slowly Growing Republics
1955—1958	1952—1971	2.7	4.3	3.0	4.0
	1952—1955	3.0	4.0	3.0	4.0
	1955—1952	3.7	3.3	4.0	3.0
	1954—1956	3.0	4.0	2.7	4.3
	1958—1971	3.0	4.0	2.7	4.3
1958—1960	1952—1971	4.0	3.0	3.3	3.7
	1952—1958	3.3	3.7	4.0	3.0
	1954—1960	4.0	3.0	3.3	3.7
	1958—1960	3.7	3.3	3.7	3.3
	1960—1971	4.0	3.0	3.3	3.7
1960—1965	1952—1971	2.7	4.3	2.3	4.7
	1952—1958	3.0	4.0	2.7	4.3
	1954—1960	2.7	4.3	2.3	4.7
	1960—1965	2.7	4.3	2.3	4.7
	1965—1971	5.0	2.0	5.0	2.0
1965—1970	1952—1971	2.3	4.7	2.0	5.0
	1952—1965	3.0	4.0	2.3	4.7
	1958—1965	3.0	4.0	2.3	4.7
	1965—1970	3.3	3.7	4.3	4.0
	1970—1971	4.0	3.0	3.0	4.0

Source: Computed by the author from ranks appearing in Table 2, Table 5, and from the ranks for indexes of trends of industrial output for six republics for the period under consideration.

Table 5 shows that the fast growing republics were on the average more variable in actual amplitudes than the slowly growing republics. This relation holds true in all but seven cases out of twenty observed. One exception is found in the 1955—1958 cycle, in the 1960—1965 cycle, and in the 1965—1970 cycle, and four exceptions are found in the 1958—1960 cycle.

The same pattern is seen for the net amplitudes. In fifteen cases out of twenty observed the hypothesized relation exists. There is only one exception in the 1955—1958 cycle, two exceptions in the 1958—1960 cycle, one exception in the 1960—1965 cycle, and one exception in 1960—1970 cycle.

On the basis of the above evidence the hypothesis that a combination of (a) high growth rates and wide cylical fluctuations and (b) low growth and mild cyclical fluctuations are found more frequently than their opposite, is accepted.

Hypothesis IV: The republics that experienced growth retardation tend to show larger cyclical fluctuations than the republics that experienced acceleration in growth.

The behavior of net amplitudes in Table 5 suggest a retardation relation between the net amplitude and growth. It is seen that in the 1955—1958 cycle the republics with a greater amplitude had higher relative growth rates prior to the cycle than during or after the cycle, Similar relation if found in the 1960—1965 cycle, and in the 1965—1970 cycle.

This relation was tested so that the following computations were performed. For each cycle period the growth intervals were selected so that the first interval measures the growth rate before the cycle, the second interval measures the growth rate during the cycle and the thrid interval measures the growth rate after the cycle. Republics were then ranked according to their growth rates for each interval. Between the two rankings of growth intervals the difference of ranks was computed. The highest algebraic differences received rank 1. The republics which received rank 1 to 3 were accelerated and the republics which received rank 4 to 6 were retarded. The accelerating republics are those which have moved up the most in growth rank, while the retarding republics have moved down the most. Republics ranked by difference between two growth intervals received the actual amplitude rank and the mean actual amplitude ranks for each interval was then computed. The same procedure was repeated to obtain the mean net amplitude ranks. The relation between retardation and amplitude is shown in Table 6, while the retardation and acceleration ranks for each republic are shown in Table 7.

Table 6 indicates quite clearly a relation between retardation and actual amplitude. The retarded republics have higher average amplitudes than the accelerated republics. In ten out of sixteen cases this relation holds. The evidence of this relation is found also in the case of net amplitude where it occurred in thirteen out of sixteen cases.

The retardation-net amplitude relation among republics suggests that a change in a republic's growth trends alters the cyclical behavior of the republic's industries relative to their national counterparts. When a republic loses its growth position its industrial components evidence stronger cyclical amplitudes.

On the basis of the above analysis the hypothesis — the higher amplitudes are followed by a relative retardation in the rate of growth — is accepted.

Hypothesis V: The national cycle is transmitted through the major industry exporting from a region to the national market. Therefore, cyclical impulses of the local key industry will be derived from the impulses the export industries receive from the national market.

TABLE 6.

RELATION BETWEEN RETARDATION AND AMPLITUDE FOR THE SIX REPUBLICS, 1952—1971

Cycle Period	Retardation Intervals	Mean Ranks			
		Actual Amplitude		Net Amplitude	
		Accelerating Republics	Retarding Republics	Accelerating Republics	Retarding Republics
1955—1958	1952—1955; 1955—1958	3.0	4.5	3.5	4.0
	1952—1955; 1958—1971	4.0	3.0	4.0	3.0
	1954—1956; 1955—1958	3.7	3.3	4.0	3.0
	1954—1956; 1958—1971	3.0	4.0	3.5	3.5
1958—1960	1952—1958; 1958—1960	3.7	3.3	3.7	3.3
	1952—1958; 1960—1971	4.7	2.3	4.0	3.0
	1954—1960; 1958—1960	4.3	2.7	4.3	2.7
	1954—1960; 1958—1971	4.7	2.3	4.0	3.0
1960—1965	1952—1958; 1960—1965	3.5	3.5	3.3	3.7
	1952—1958; 1960—1971	4.7	2.3	4.7	2.3
	1945—1960; 1960—1965	3.0	4.5	4.3	2.0
	1954—1960; 1965—1971	4.7	2.3	4.7	2.3
1965—1970	1952—1965; 1965—1970	3.3	3.7	4.3	2.7
	1952—1965; 1970—1971	4.3	2.7	4.0	3.0
	1958—1965; 1965—1970	3.3	3.7	4.3	2.7
	1958—1965; 1970—1971	4.0	3.0	4.3	2.7

Source: Computed by the author from the ranks appearing in Table 2 and Table 4, and from the ranks for cyclical retardation rates.

TABLE 7.

ACCELERATION AND RETARDATION RANKS FOR THE SIX REPUBLICS, 1952—1971

Republics	1952—1955 1955—1958	1952—1955 1958—1971	1954—1956 1955—1958	1954—1956 1958—1971	1952—1958 1958—1960	1952—1958 1960—1971
Bosnia-Herzegovina	5.0	3.0	6.0	6.0	2.0	6.0
Montenegro	3.5	4.0	3.0	3.5	3.0	5.0
Croatia	6.0	5.5	4.5	3.5	4.5	3.0
Macedonia	2.0	1.0	4.5	1.0	6.0	2.0
Slovenia	3.5	5.5	1.0	3.5	4.5	4.0
Serbia	1.0	2.0	2.0	3.5	1.0	1.0

Republics	1954—1960 1958—1960	1954—1960 1960—1971	1952—1960 1960—1965	1952—1958 1965—1971	1954—1960 1960—1965	1954—1960 1965—1971
Bosnia-Herzegovina	2.5	5.5	6.0	5.0	6.0	4.0
Montenegro	4.0	4.0	3.5	6.0	3.0	6.0
Croatia	1.0	1.5	3.5	2.5	3.0	1.5
Macedonia	5.0	1.5	2.0	2.5	3.0	3.0
Slovenia	6.0	5.5	5.0	1.0	5.0	1.5
Serbia	2.5	3.0	1.0	4.0	3.0	5.0

Republics	1952—1965 1965—1970	1952—1965 1970—1971	1958—1965 1965—1970	1958—1965 1970—1971
Bosnia-Herzegovina	6.0	2.0	5.5	2.0
Montenegro	5.0	6.0	5.5	6.0
Croatia	1.5	5.0	1.5	3.5
Macedonia	3.0	4.0	3.0	3.5
Slovenia	1.5	2.0	1.5	1.0
Serbia	4.0	2.0	4.0	5.0

Source: Computed by the author from the ranks for indexes of trends of industrial output for six republics for the period under consideration.

In order to accept or to reject this hypothesis the correlation coefficient between the hypothetical amplitudes and residuals were computed. A residual is the difference between the actual and the hypothetical amplitude and reflects the difference between the cyclical behavior of the republics industries and their national counterparts. If

the correlation coefficient between residuals and hypothetical amplitude is positive this will indicate the presence of the key industry effect.[13])

Correlation between residuals and hypothetical amplitudes appeared to be positive in the 1955—1958 cycle, in the 1958—1960 cycle, and in the 1965—1970 cycle, but in the 1960—1965 cycle the correlation coefficient was negative.

On the basis of the above test the hypothesis that the national cycle was transmitted to the region through the major industry exporting to the national market can be accepted.

SUMMARY AND CONCLUSIONS

This study of regional cyclical fluctuations in Yugoslavia centers around five hypotheses which explore in the main the causes of regional business cycles, their relation to the long-term growth patterns, and the regional transmission of the cycles. The testing of the hypotheses was based on industrial output for the six Yugoslav republics for the period between 1952 and 1971.

The statistically significant results of the empirical testing lead to the acceptance of the hypothesis that regional business cycles in Yugoslavia do exist. Moreover, the research pointed out that the severity of the cyclical fluctuations has been increasing from cycle to cycle, with the greatest increase occurring in the fifth of the six cycles studied. The republics in which the fluctuations were found to be most pronounced, that is, Bosnia-Herzegovina, Montenegro, and Macedonia, represent the underdeveloped areas of the country. Since these republics show great irregularity in fluctuations, the cycles were difficult to define. There is little similarity between the national cycle and the cycles of underdeveloped republics. On the other hand, the cyclical fluctuations of Slovenia and Croatia, which are the two most developed republics of Yugoslavia, are very similar to the national cycle and show considerable stability.

During the fifth cycle, Bosnia-Herzegovina, Macedonia, Montenegro and Serbia experienced a negative growth rate, indicating an economic slowdown of the type not experienced during previous cycles. This situation could possibly have been avoided had appropriate anticyclical policy measures been used.

As regards the relation of regional cycles to the long-term growth patterns, the analysis pointed out that growth trends have an important influence on cyclical variability. The combinations of high growth rates and wide cyclical fluctuation and low growth rates and mild cyclical fluctuations are found more frequently than their opposites. Republics which experience retardation in growth relative to other republics tend to have larger cyclical fluctuations. The republics which show the greatest retardation are Bosnia-Herzegovina, Montenegro and Slovenia. Since both developed and less developed republics are included in this group, it could appear that the phenomenom of retardation

[13]) The correlation coefficient must bear a positive sign becaues of the assumption that the regions which contain industries of large national amplitude will tend to have greater actual amplitude than expected on the basis of composition and the opposite.

is not related to the level of development. Implicit in the retardation is a decline in the growth of the republic which has been retarded, which in turn impairs its accumulation ability. The resulting underinvestment in plant and equipment leads to the appearance of high cost production facilities which inhibit growth at the old relative rate. These conditions will cause industries in the republic which experienced retardation to have stronger cyclical amplitudes than their national counterparts. If such retardation occurs in an underdeveloped republic, this is likely to widen the gap between developed and underdeveloped republics because of a decline in accumulation in the underdeveloped republics experiencing retardation. Retardation in a developed republic will have the same effect, if we assume that reduced accumulation will affect its financing of investment in other republics by more than its own investment. In both cases the retardation will finally result in the decline in the growth rate for the nation as a whole.

The hypothesis that cyclical impulses of the local industry are derived from the impulses that export industries receive from the national market was confirmed in the second, in the third, and in the fifth cycle.

The statistically insignificant results lead to the rejection of the hypothesis that long-lasting differences in cyclical fluctuation among the republics do not exist.

The test of the influence of the industry-mix effect yielded results on the basis of which we can conclude that industry-mix was present. However, the negative rank correlation coefficient of industry amplitudes leads to the conclusion that the industry which was the most variable in one cycle was not the most variable in other cycles. The expected relation holds true only for the fourth and the fifth cycle.

It is admitted that stable development of each individual region as well as reducing regional differences are both wortwhile goals to follow. This study showed that in the period under study anticyclical policy as well as policies which are designed to eliminate differences in the level of development among the republics failed to do full justice to these two goals. Therefore, in the future these policies have to be designed so that the growth of Yugoslav economy will become more stable. The question of how this could be achieved awaits future research.

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REGIONALNI PRIVREDNI CIKLUSI U JUGOSLAVIJI

Tea PETRIN

Rezime

Cilj ove analize je istraživanje regionalnih privrednih ciklusa u Jugoslaviji, njihovog odnosa prema dugotrajnom rastu i prenosa ciklusa na regije. Analiza bazira na tretiranju pet hipoteza.

Prva hipoteza predviđa, da postoje signifikantne razlike u cikličkom kretanju među republikama. Druga hipoteza pretpostavlja da razlike u karakteristikama republičkih ciklusa nastaju pre svega zbog razlika u industrijskoj strukturi. U trećoj se govori o značajnom uticaju trendova rasta na cikličku varijabilnost. Četvrta se odnosi na cikličku varijabilnost. Četvrta se odnosi na stepen povezanosti između regionalnih ciklusa i retardacija porasta, a peta hipoteza bavi se prenosom ciklusa na regiju.

Regionalni privredni ciklusi u Jugoslaviji računati su na bazi promene u stopama rasta industrijske proizvodnje za period od 1952—1971. Podaci su očišćeni od sezonskih i iregularnih varijacija.

Rezultati testa pokazali su da u Jugoslaviji regionalni ciklusi postoje i da su oni delimično rezultat razlika u industrijskoj strukturi. Istraživanje nameće zaključak da razlike u stopama porasta i retardacija porasta znatno utiču na cikličku varijabilnost republika. One republike, za koje je karakterističan visok stepen porasta ili koje su doživele retardaciju porasta, imale su relativno visoku fluktuaciju u odnosu na ostale republike. Pojava, da se cikličke fluktuacije prenose iz nacionalnog okvira na regiju preko glavnih izvoznih industrija, statistički je signifikantna u drugom, trećem i petom ciklusu.