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Growth and Technical Progress in the Socialist Enterprises of Yugoslavia: A Cobb-Douglas Analysis Using Extraneous Estimators

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SUMMARY

This paper estimates the coefficients of a Solow type Cobb-Douglas function: the regression equation relates real value added to real capital, labor and a technological proxy variable, time. The model is applied to nineteen productive industries of the social sector of the Yugoslav economy, cross classified by five geographic regions. The estimates are to be used in two companion pieces that analyze the behavior of enterprises and sources of growth in Yugoslavia.

Econometric research of the past decade has made the statistical estimation of production functions less, not more credible. Much of the discussion here is concerned with two issues raised by these writings: simultaneous equation bias; and the instability of the estimates for different samples and estimators. The conclusion is reached that the amount of simultaneous equation bias present in the estimates is small, and that the estimates are highly stable with respect to the estimators but less stable with respect to the grouping basis and time period of the sample. The estimates themselves are judged to be economically meaningful measures of the Cobb-Douglas model that is assumed.

Three econometric innovations are employed. One is to use the multi-table method of Yoel Haitovsky to obtain estimates of the capital and labor output elasticities. This is possible because for 1963 and 1964, cross-section data is available for the nineteen industries. The tables are for Yugoslavia, but not for the four sub-regions. The data groups all firms in each industry into twelve cells according to their size; separate tables are published for size as measured by fixed assets and by employment. Haitovsky's method uses the capital table to estimate the capital coefficient and the labor table to estimate the labor coefficient, and then corrects these estimates to remove the bias due to mis-specification.

Another innovation is to use a "reverse covariance" estimator and Haitovsky's method to demonstrate the unimportance of the simultaneous equation bias that arises from a correlation between labor and the stochastic term. A "reverse covariance" estimator reverses the table subscripts in Haitovsky's method so that the capital table is used to estimate the labor coefficient and vice versa. It is an inefficient estimator, but one that is bias-free. Its counterpart, the "ordinary covariance" estimator that results from a standard application of Haitovsky's method, is efficient but subject to bias. A collation of the ordinary and reverse covariance estimates reveals that the estimates for the capital and labor coefficients are identical for both estimators for the aggregate economy and for its largest sub-sector, industry and mining. The common capital estimate for both industries is .13, the labor estimate is .89. It is argued that differences between the estimators for the seventeen remaining industries can be explained by sampling variation. The conclusion is reached that simultaneous equation bias is not of practical importance, and therefore, on the basis of efficiency the ordinary covariance estimator is deemed best.

The third innovation is to use the cross-section capital and labor estimates as extraneous estimators in the 1952-1964 time series analysis. This leaves only the coefficient of neutral technical progress to be estimated from the time series. To extend the analysis to the five regions it is necessary to assume no regional variability in the capital and labor coefficients, thus permitting use of the Yugoslav cross-section capital and labor coefficients for all regions. Formally, this is not permissible Statistical tests using data available only for industry and mining indicate that these coefficients do differ between regions. However, the differences are less important because of the manner in which the majority of the estimates cluster about the values .13 and .89 mentioned above. The stability and magnitude of the regional coefficients of technical progress support the contention that extraneous estimators give meaningful results. For example, the regional technical progress coefficients for industry and mining are:

Yugoslavia	3.8%
North	3.7%
South	3.3%
Serbia Proper	3.7%
South less Serbia Proper	2.7%

Although not an innovation, the paper does derive and present, in the Appendix, production data not heretofore available. For five regions, for nineteen industries, for the years 1952 to 1966, four variables are given: employment, total fixed assets, equipment, and value added (social product). The last three are in constant 1966 prices and therefore benefit from the price rationalizations of the 1965 Reform. The most important new contribution of this data is the creation of constant price, regional series on value added for twelve branches of industry and mining. The capital series is unique in that empirically obtained estimates of length of life for plant and for employment are used as durability weights in the manner advocated by Haavelmo.

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PART I
PROBLEMS OF SPECIFICATION AND IDENTIFICATION

Introduction

This paper[1] provides a formal statistical analysis of the growth of real output among the socialist enterprises of Yugoslavia. According to the Cobb-Douglas model used, growth is explained by three factors: the mobilization of capital and labor, increasing returns to scale at the industry level, and disembodied technical progress. Temporarily, no cognizance is given to the changing quality of labor or capital, to non-neutral technical progress, or to structural shifts between the branches of the social sector. The objective is to see how successfully a statistical analysis of inputs and outputs can explain differences in output between regions, between industries, and overtime. Attention is restricted to the time period between the establishment of the New Economic Policy in 1952 and the Reform of 1965. Since this paper serves as a foundation for more economic and policy-oriented works under preparation, concentration centers on the statistical methodology and results rather than their economic interpretation.

Already we can imagine a scowl from econometricians, and a yawn from development economists. A quick summary of the major problems and our proposed solution is necessary to relax these countenances and preserve readers.

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[1]Work is currently under way on two companion pieces. The first is a Denison type analysis of the determinants of aggregate growth for all sectors. Since wages and prices cannot be relied upon to reflect marginal products, the productivities derived in this paper are a crucial input. The second is a theoretical and empirical microanalysis of enterprises behavior. How has the system of Workers Management contributed to the rapid growth of the Yugoslav economy? Again, this paper provides the foundation for the analysis.

Only a very brief search of the literature is needed to find eminently qualified critics of statistical production functions. Professor Edmund Malinvaud writes:

> ...the calculated regression is not a satisfactory estimate of the production function. It constitutes a purely artificial relation which depends on the correlations among the...error terms...just as much as on and . Statistical Methods of Econometrics (Chicago: Rand McNally, 1966), p. 519.

or, Professor Murray Brown:

> The impossibility of identifying the estimates because of multicollinearity when using cross-section data has been touched on, with the conclusion that cross-section data is useless except for very limited purposes in the present context. However, there is also an identification problem because of multi-collinearity using time-series data. On the Theory and Measurement of Technological Change (Cambridge: Cambridge University Press, 1966), p. 126.

or finally, Sir John R. Hicks:

> I cannot myself perceive that there is any economic sense in such a physical measure of the capital stock. It is futile to erect great edifices of theory, and of econometrics, upon it. The estimation of production functions--involving a distinction between accumulation of capital (in some such sense as this) and technical progress (residual technical progress)--seems therefore to me to be a vain endeavor. "The Measurement of Capital," a paper delivered at the International Statistical Conference, London, Summer of 1969, p. 11.

These criticisms are selected not only because of the excellent credentials of the authors but also because they describe the three problem areas that are most relevant to this study: (1) lack of identification due to simultaneous equation bias; (2) or to multi-collinearity; and (3) difficulties in the definition and estimation of the capital stock.

The greatest hurdle in making production function estimates credible to econometricians is the lack of identification due to simultaneous equation bias. One tour de force that can be performed is to incorporate simultaneous equation bias into one's theory thereby making it an effect we wish to measure rather than a "bias." Granted the purpose of our estimates, institutional realities in Yugoslavia make it possible, even essential, to incorporate certain mechanisms of resource allocation into the aggregate parameters. Specifically, the distribution of management ability and the intra-industry investment allocation mechanism are effects which are built into our estimates of the capital and labor coefficients. Effects of this type that are included in our estimates of the coefficients are consequently excluded from the measure of technical progress. The rationale for not including management and investment effects under the technical progress rubric are explained later in this section.

Even if the reader agrees to go along with us and like some of the things which cannot be changed, the problem of correcting what isn't liked remains: A model and an estimator are needed that will eliminate the unwanted portion of the bias. Our approach is to first specify a model which is appropriate to the Yugoslav economy, and define six different statistical estimators of the parameters of the model. Next, on a priori grounds these six estimators are crudely ranked in two ways: according to the possible biases that might affect them; and according to their expected efficiency. Finally, after the estimates are computed, select the most bias free estimator that meets a minimum efficiency standard. Anticipating the conclusion, the estimator which ranks highest (under a favored assumption it is completely bias free) and the estimator which ranks lowest on our bias scale but has maximum efficiency, give nearly identical results for aggregate sectors. Consequently, we conclude that simultaneous equation bias is not an important problem with the model used, and that considerations of efficiency may be allowed to determine the best overall estimator. We will treat the other two problems of production function estimation more briefly since, with respect to multi-collinearity, there is not much that can be said, and with respect to the capital stock a more detailed disucssion is given in the Appendix.

In a properly specified model, the deleterious effects of multi-collinearity reveal themselves in large standard errors for the coefficients.[2] However, Brown's concern (and that of the myriad scholars he cites)[3] is that the true values of capital, labor and output prescribed by our theory are so highly correlated in the data sample that the parameter estimates are really being fitted to perturbations in the data arising from short run disequilibria, monopoly imperfections, and so forth. Not being able to observe short run disequilibria, monopoly imperfections and similar phenomena, no real test of this assertion is possible. We would expect, however, that if the estimates were principally determined by such perturbations, the parameter estimates for different, independent, cross-section samples would be highly unstable. We do not feel our estimates show this degree of instability, but the reader may reserve judgment until the estimates are presented. There is no question but that multi-collinearity in the data is high. For example, from the Employment grouping in Table 2, the capital-labor correlation is .986, the capital-output .991, and labor-output .999.[4] These high correlations are typical of the cross-section data and yet they do not cause destructive increases in the standard errors of the coefficients. Another statistic from Table 2 suggests the reason for this: while multi-collinearity is large, so too is the range of the capital-labor ratio (from a minimum value of 1.2 to a maximum of 5.2).

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[2]"Thus the standard errors should give ample warning of the imprecision attaching to the estimates of the separate effects of X_2 and X_3, when the two variables are highly correlated" J. Johnston, Econometric Methods (New York: McGraw Hill, 1960), p. 204.

[3]Brown, op. cit., p. 37n.

[4]The measure presented is computed from unweighted, per-firm data for the twelve size categories.

This great range of the ratio of the independent variables provides adequate information for the estimation of statistically significant coefficients.

Hopefully, the range is also sufficient to overcome the distorting effects of any systematic perturbations of the type mentioned by Brown. Like the cross-section data, the time-series also exhibits high multi-collinearity. In this case, however, the range is much smaller, and consequently we place as little emphasis as possible on the use of time-series to unscramble the competing effects of capital and labor.

While identification is the statistical hurdle most prominently hindering creditable estimates, the theoretical problem of greatest difficulty is how to measure capital's contribution to production. It is this difficulty that leads Professor Hicks to question the validity of any attempt to production function estimation similar to the type we propose. The more detailed questions of deflation and measurements of capital stock are relegated to Appendix C . At this point we are only concerned with the more overriding question of whether or not theoretical problems in the definition of capital and in the contribution of capital to production make it a "vain endeavor to construct statistical production functions." In a recent review of this literature, Israel M. Kerzner[5] convincingly concludes that whether capital is to be treated as a flow of services or as a stock of goods whose very existence contributes to production with no diminishment of the stock's capability, depends on the time period of the analysis. Where the relevant time period is the planning horizon of the firm, all inputs must be considered variable so that a flow approach is the proper one. On the other hand, as we consider shorter and shorter time periods, more variables become fixed for the purpose of analysis and it

[5] An Essay on Capital (New York: August M. Kelley, 1966), particularly Chapter Two.

becomes appropriate to treat them as a stock which contributes to production simply by its presence. This latter approach is espoused by Trygve Haavelmo[6] and adopted by us. In adopting the position that capital contributes to production simply by its presence rather than by providing a stream of services, we subject ourselves to Kerzner's criticism of this approach. Essentially it is that we neglect the question of multi-period planning which both generates the capital stock at the beginning of the year and which receives it at the termination of each year.

One of the principal difficulties in the Haavelmo model is the necessity of adjusting for differing durabilities of capital goods, a problem which is discussed in the capital stock Appendix C. It will suffice here to mention that we make no such attempt at adjustment in the cross-section data and consequently make the implicit assumption that the durability mix for the capital stock of firms in different size categories is all equal. In the time series data we make an explicit adjustment for the varying durabilities of equipment as opposed to structures.

Buttressed by these comments, we hope the reader will hold his skepticism in abeyance while the model and its statistical estimators are discussed in detail. Those more interested in results than method may skip the following section without great loss.

Data, Model, and Estimators

It is assumed that the real output of the enterprise depends on five inputs, three measureable and two not measureable: the former are the input of labor in man years, the input of capital goods measured in constant price

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[6] _A study in the Theory of Investment_ (Chicago: University of Chicago Press, 1960).

dollars (and adjusted for differing durabilities), and intermediate inputs; the latter are the skill of management in combining the productive factors, and the state of technological knowledge. A visual introduction to these variables is given in equation (1.1) where Y, L, K and G denote the quantitatively observable variables--output, labor, capital and intermediate goods; and M and T represent the non-observable variables--management and technology. This overly abstract statement is intended to serve only as a peg for discussing some of the more general problems of production function estimation.

$$(1.1) \quad Y = f(K,L,G: M,T)$$

Our first problem is aggregation. We begin with a description of the data generated by the disaggregate firm and discuss, step by step, the aggregations made by ourselves and the Federal Statistical Bureau of Yugoslavia (SZS). This somewhat round-about process serves to emphasize that the underlying data collection is done on an exhaustive basis covering all firms each year. Although the published variables and aggregates vary from year to year, they are generated by the same censal process. At times we are forced to splice together various series because the data for the entire population is not published annually. The underlying continuity of the censal process is important since it means we do not have such serious problems in comparing data from different time periods and different sectors as we would have if they were generated by differing sets of surveys and samples. What we have are various windows looking into the population of firms, the windows change their location through time, but they always continue to observe the complete population of firms without distortion.

Since 1958, individual firm data covering a multitude of variables including K., K and G are available to the SZS on an annual basis. For a few years this data is also available outside of Yugoslavia and can serve as the basis for making a completely disaggregate study. For reasons of cost and availability, our study does not utilize such data but instead relies on publicly available aggregates. The aggregation of firms into industries is an obvious first step. In this direction it is possible to obtain much of our data for a 41-sector breakdown of the economy. However, even this level of aggregation is too burdensome.

Table 1 describes how we aggregate the nine basic sectors of the economy into six, and how the twenty-two branches of industry and of mining are aggregated into twelve. This aggregation of firms into industries is not as destructive to information as it might appear since after 1962 we have available cross-sectional data on each of the industries. The cross-section data, described in more detail below, groups firms in each industry according to their size so that our aggregation ultimately produces the observable variables of (1.1) for each of nineteen industries (two aggregates and seventeen independent branches) cross-classified by 12 size categories. In the dimensions of geography, we use a 5-region aggregate.[7] With respect to the temporal unit, although some of the data is available on a monthly basis, we are not sufficiently interested in short-term dynamics to attempt to utilize this information: the basic unit of analysis is the year. In summary, the first step in simplifying the data is to aggregate into 19 industrial branches, 12 size categories, 5 regions, and all in all, some 15 years. Obviously, this still leaves us with a need for much further simplification.

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[7](1) Yugoslavia; (2) North (Slovenia, Croatia and Vojvodina); (3) South (Bosnia and Hercegovina, Montenegro, Macedonia, Serbia proper, the Kosmet); (4) Serbia proper; (5) South less Serbia proper.

The greatest contribution to data simplicity, and the greatest loss to information occurs because the cross-section data does not become publicly available until 1962. At the time of this writing, a time series of the cross-section data by our nineteen sectors is available for 1962 through 1966. However, we will only be concerned with two years of this data: 1963 and 1964. The year 1962 was one of mini-recessions and the existence of excess capacity in many plants makes it ill-suited for supply analysis. The years 1965 and 1966 are beyond our temporal focus and, particularly in the later years also suffer from the fact that severe cut-backs in the rate of growth and transition problems associated with the reform of 1965 again cause low capacity and labor utilization to distort production relationships. A pilot study described below shows that the incorporation of years subsequent to 1964 does not improve the estimates. The lack of availability of size-classified data further restricts our attention to Yugoslavia as a whole. Only for the sector industry and mining is data available by size category and by republics. This breakdown for industry and mining does enable us to make trial tests of parameter stability over regions, but an extensive analysis of stability for all sectors is not possible.

What we are left with by these aggregations and data black-out are three basic sets of data: first, time-series data for the years 1952 to 1966 according to 19 economic sectors and 5 regions; second, for the 19 sectors, for Yugoslavia only, for the years 1963 and 1964 we have cross-section data where the cross-section grouping is according to the size of the firm with 12 levels being presented; third, for industry and mining alone, for 1963 and 1964, and also for 1965 through 1967 the same aforementioned cross-section data further presented according to Republics.

TABLE I

AGGREGATION OF PRODUCTIVE SOCIAL SECTOR ACTIVITIES:

ECONOMIC GROWTH CENTER AND RELATED TWO-DIGIT

YUGOSLAV CLASSIFICATIONS

EGC		YUG
000	Total Productive Sector	000
001	Industry & Mining	001
002	Agriculture & Fishing	002
003	Construction	004
004	Transport & Communications	005
005	Handcraft	003, 006, 007
006	Other (Forestry, Trade, and Utilities)	003, 006, 008

INDUSTRY AND MINING

111	Electricity	111
112	Coal and Coal Mining	112
113	Food, Drink, Tobacco	127, 129
114	Textiles and Clothing	124
115	Timber and Furniture	133
116	Paper Printing and Publishing	123, 128
117	Leather, Rubber and Footwear	125, 126
118	Stone, Clay and Glass	116, 121
119	Chemicals and Petroleum	113, 120
120	Metal Using	117, 119
121	Metal Making	114, 115
122	Miscellaneous	118, 130, 131, 132

We initially focus attention on the terminal years 1963 and 1964 where the best data is available, analyze this period in detail, then use the results obtained from this benchmark to investigate the time path which brought the economy to this terminal point. A crucial step in the statistical analysis is to use the output elasticities obtained from the 1963-64 cross-section analysis as extraneous estimators for our analysis of technological change in the broader 1952 to 1962 period.

Equation (1.1) postulates a relationship between gross output and a set of inputs which include intermediate products. A significant simplification of the analysis is achieved by deleting intermediate products from the inputs and relating value added to capital, labor, and the non-observable variables. Table 1 presents evidence that suggests this constriction of the analysis does not have any serious effects on our appraisal of the sources of growth. This table presents for the total economy (social plus private sectors), the social sector, and industry and mining, the ratio of intermediate products consumed to value added. For each of these three sectors of the economy, but particularly for the first two, the change in this ratio between 1962 and 1964 is unimportant. In a more practical vein, although we do have current price time series data on intermediate goods (the variable G), no deflated series are currently available and the possible gain from creating such a series does not seem to be worth the work required.

The question of whether or not to include intermediate goods also arises in our analysis of the cross-section data. Since we mean to use this data to obtain extraneous estimators of output elasticities, there is the possibility that the omission of intermediate goods from the production relationship will be a mis-specification of the true model and consequently lead to

TABLE 2

RATIO OF MATERIAL EXPENDITURE TO VALUE ADDED
(SOCIAL PRODUCT)*

SECTOR	1952	1959	1964
Total Economy	.95	1.05	.96
Social Sector	.95	1.05	.96
Industry and Mining	1.15	.73	1.24

* All underlying measures are in current prices and taken from *SB 228* and *SG 1966*.

biased estimates of the capital and labor output coefficients. When using value added as a dependent variable, the inclusion of intermediate goods as an independent variable implies that these goods can be substituted for either capital or labor to obtain increases in value added.[8] To our knowledge no empirical evidence on this question is available. In the Yugoslav cross-section data there is a tendency for the larger firms to have relatively high capital/labor, output/labor, and intermediate-good/labor ratios. This could mean that larger firms tend to substitute intermediate goods for labor thus biasing the coefficients of a model which excludes intermediate goods. Unfortunately, we do not have adequate data for making a rigorous test of this possibility. In all the work that follows we assume that the input of intermediate products does not influence the output of value added.

The next variable, one particularly important to the cross-section analysis, is management ability as denoted by the variable M in equation (1.1). Distinguishing technology, as represented by T, from the ability of management is an awkward definitional problem. For our purposes it will suffice to define managerial input as a class of decisions: specifically, those dealing with pricing, organization, finance, and product line decisions. These decisions are to be distinguished from the more purely technological ones concerning plant layout, production processes, etc. that relate machines and labor to output. While "management decisions" are made at all levels, they are concentrated in the Director and Workers' Council. This distinction is important because we argue that in under-developed countries the absence of a large stock of professional managers or an annual crop of business school graduates means that the principal determinant of management capability is

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[8]A brief survey of this literature is available in Murray Brown, _op. cit._, pp. 120-127.

management experience, and this experience is gained by operating the plant where that management is currently employed. Not only is formal education without experience a relatively unimportant determinant of management capability, but also there is a small amount of management switching between enterprises.[9] Certainly, in the case where management is selected on the basis of political rather than economic considerations, we may attribute superior performance by management in the larger firms to the experience they get from running such firms.

But it is Workers' Management in Yugoslavia that is a more overriding reason for feeling that management capability is a non-transferable input. Since the top policy-making boards of the enterprise, the Workers' Council and the Board of Management, are elected on a rotational basis from among the workers, it can be argued that a correlation between the efficiency of management and the size of the firm is a direct consequence of that scale. Formally, we may express this association between management skill and the scale of operations by the functioning in (1.2). That is, we measure the scale of operations by the inputs capital and labor.

$$(1.2) \quad M = g(K,L)$$

The consequence of this definition is that we attribute to the capital and labor inputs their role in improving management as well as their direct productive uses; therefore, it is implied that largeness is itself the source of management improvement, so that increases in scale provoke automatic increases in efficiency.

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[9] We do not know of any surveys that present data on the extent to which the recruiting of management is done internally. The ILO describes the formal requirements for "open competition," but also notes that these were often not successful because of the lack of qualified candidates. Workers Management in Yugoslavia (Geneva: 1962), p. 102, fn. 3. In the one relevant example cited by the ILO, a new director was internally promoted. Ibid., p. 115.

A related problem with a similar solution is posed by investment policies. Central planning of investment may result in the most efficient firms getting the largest allocation of investment funds so that efficient firms are large and inefficient firms small. This intra-industry efficiency of investment allocation is an effect that will be embodied in our production fruition estimates.[10] It is a bias if the sole objective is to estimate parameters for a representative individual firm. However, where we wish to measure sources of growth, it is permissible to consider the intra-industry investment allocation mechanism as an unchanging, "invisible hand." Consequently, parameter estimates incorporate the activities of both those economic agents who allocate intra-industry investment as well as those agents' management who determine production given the set of available resources.[11] For the 1952-1964 period, this former set of agents would include members of the National Bank, the Investment Bank. The effects of inter-industry allocation, or "investment strategy" and typically practices by a planning bureau are absent except in estimates for aggregate sectors.

A modified production relationship incorporating value added rather than gross output as the independent variable and removing intermediate goods management skill as inputs is given by equation (1.3) where Y denotes value added. The companion piece mentioned earlier adjusts for changes in the

$$(1.3) \quad Y = h(K,L;T)$$

[10]Where data or the individual firm is available Yair Mundlak describes how "management bias" may be removed by covariance analysis. See his "Estimation of Production and Behavioral Functions from a Combination of Cross-Section and Time-Series Data" Measurement in Economics: Studies in Mathematical Economics --Econometrics in Memory of Yeguga Grunfeld (Stanford: Stanford University Press, 1963), p. 143. Since our cross-section data is grouped, this approach is not available.

[11]This distinction between agents is advocated by Thomas Marschak, "On the Comparison of Centralized and Decentralized Economics," American Economic Review: Papers and Proceedings, May 1969, Vol. 59, No. 2.

length of the work week, the participation ratio for women, education, and other variables influencing labor input, but at this point we rely on a crude man-year definition of labor input. The capital variable is based upon the purchase cost to the enterprise, or accounting value before depreciation. The cross-section studies in 1963 and 1964 benefit from a revalorization of all capital goods in Yugoslavia in 1962 which sought to adjust their book value to current market prices, but no attempt is made to deflate the 1963 and 1964 increments in the capital stock in constant dollars, nor is there any attempt to weigh the various equipment and structural components according to durabilities. However, as discussed in the data appendix, the time series of capital stock does correct for durabilitie and price change. We now turn to the question of functional forms.

While a great variety of functional forms are potentially available for this analysis we consider only two as serious contenders: a conventional Cobb-Douglas type function with disembodied technological progress as introduced by Solow; and a CES production function of the form fitted by Martin L. Weitzman to the Soviet economy.[12] We conclude in favor of a Cobb-Douglas function.

This is important since Weitzman's objective is similar to ours, and centers its focus on the same time period. The most important factor leading Weitzman to fit a CES rather than a Cobb-Douglas function is the rapid increase in the Soviet capital/labor ratio during the period from 1950 to 1966: it increased from a base of 100 in 1952, to 150 by 1959, and 286 by 1964. Clearly, capital/labor substitution is an important part of Soviet growth so that if the elasticity of substitution is mistakenly assumed to be unity, this

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[12] Martin L. Weitzman, "Soviet Postwar Economic Growth and Capital Labor Substitution," Cowles Foundation Discussion Paper No. 256, October 30, 1968.

specification error may have an important effect upon results. The situation in Yugoslavia is quite different. For the social sector the same capital/labor ratio with a base 1952 value of 100 actually declines to .94 by 1959, and increases only moderately to 1.20 by 1966.[13] Therefore, due to the absence of capital/labor substitution the implicit assumption of the Cobb-Douglas function that the elasticity of substitution is unity cannot be of great importance to the analysis. For the briefer period 1952 to 1964, the unimportance of substitution becomes still clearer--the 1964 value is only 106. This does show, however, that between 1964 and 1966 the capital/labor ratio grew by 13 percentage points so that a model of the post-reform economy may require a CES function performed by Weitzman.

Equation (1.4) summarizes our description of the available data and our decision to incorporate it into a Cobb-Douglas type function. Data limitations impose that the cross-section variables referenced by the subscripts are available only for 1963 and 1964; and with the exception of industry and mining, we do not have these cross-sections available by regions. Two additional variables included in the data appendix but not included in relationship (1.4) are provided by a breakdown of the capital stock into its structures and equipment components. Since this subdivision is not available for the cross-section data it is simpler to omit it from the discussion at this time.

$$(1.4) \quad Y_{irts} = A_{irt} K_{irts}^{\alpha_{ir}} L_{irts}^{\beta_{ir}}$$

i refers to 19 industries of which two (the total for the social sector and the total for industry and mining) are obtained as aggregates of the others, so there are 17 independent industries.

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[13] The fact that Yugoslav social sector includes agriculture does not importantly distort these findings since the socialized part of agriculture is comparatively small and the capital/labor ratio in that branch has a movement similar to the aggregate social sector: 100 in 1951; .92 in 1959; and finally, 1.13 in 1966.

r refers to 5 regions of which two (Yugoslavia and the South) are obtained as aggregates, so there are 3 independent regions: North, Serbia Proper and South less Serbia Proper.

t refers to the 13 years 1952 to 1964.

and s refers to the 12 size of firm categories (defined either by employment, capital stock or output).

In addition to specifying a Cobb-Douglas function, (1.4) indicates that returns to scale, measured as the sum of α plus β, is a variable to be estimated from the data, and that both the capital and labor coefficients are allowed to vary by industry and by region. Different capital/labor coefficients for different industries is a specification that can hardly be questioned. Differing coefficients by regions, however, is a specification that may be unnecessary and one that we can and do test for.

All estimates are based upon the assumption that technical progress is neutral and disembodied. Consequently, there are no time subscripts to either alpha or beta. Besides being neutral and disembodied, we often will find it useful to assume that technological progress, as indicated by equation (1.5), is smooth and exponential in its occurrence.

$$(1.5) \quad A_{irt} = \mathrm{Exp}\ (\lambda_{irt})$$

Before beginning a discussion of the stochastic specifications of the regressions, it is necessary to briefly consider the broader sets of simultaneous equations from which we have lifted the production relationship (1.4).

The identification question was introduced earlier with the quotations from Professors Malinvaud and Brown. It was argued that in a study such as ours with limited objectives, it is possible to partially dodge the issue by accepting certain types of bias as being desirable. Management bias is an example of this. Beyond these effects there are many other sources of possible bias, however, which we hope to eliminate by the selection of an appropriate model and estimator. Ideally, we need a theory of behavior for Yugoslav enterprises, a theory which will tell how available resources, the decentralized market system, workers management, and centrally influenced investment allocation determine the capital and labor inputs. Unfortunately, in our opinion, no such theory is currently available, nor does any seem possible without extensive investigations of empirical behavior. While we will make some conjectures, these are too tentative to serve as the basis for deriving a set of simultaneous equations that can serve econometric needs. Consequently, we instead concentrate upon single equation methods that are the least subject to errors of model specification.

Six single-equation estimators are tried. Some of these are completely bais-free if one grants their assumption. Generally, however, it is quite difficult to tell whether these assumptions are satisfied or not. For example, the use of lagged values of the independent variables as instrumental variables produces bias-free estimates if the lagged values are not correlated with the contemporary error term. It would seem that many of the transitory factors, such as weather which affect production in one year and produce a correlation between the error term and one of the input variables might not exist in subsequent years. On the other hand, one can also think of effects such as we have described for management and intra-industry investment allocation which would continue for long periods. While a variety of assumptions of this type underlie the different estimators, there is one assumption used by some of the estimators and not by others, that appears by us to be strongly justified by the realities of the Yugoslav economy. This is that the capital stock, save for the intra-industry investment allocation effect described above, is free of correlation with the error term.

This assumption of a zero correlation is based on two facts: first, investment is determined by the development plan and the intra-industry investment allocation mechanism, and not by the rate of interest.[14] Second, there is a substantial lag between the initiation of new investment products and the time when their output first comes on stream. This lag is usually estimated to be from three to four years in duration on the average. Consequently, changes in the capital stock this year are consequently decisions made some years ago, decisions that are not apt to be influenced by the size of the current error term. Mundlak supports this point of view even for capitalist economy by arguing that in a model using annual data, capital may be treated as a fixed factor.[15]

Equation (1.6) gives the essential stochastic specifications:

$$(1.6) \qquad E_{irts} = H_{irt} U_{irts}$$

The error term E is composed of two statistically independent components: the first term, H, measures those perturbations which are common to firms of all sizes, but which vary from year to year; and the second term, U, measures those perturbations which differ both from year to year, and from firm to firm. If the two variables H and U are uncorrelated with the inputs K and L, then estimates of alpha and beta are unbiased estimates of the theoretical concepts which we seek to measure. However, correlations between either of the two stochastic components and the inputs cause a biased parameter estimate. We shall call correlation between the inputs and H "temporal bias," and correlation

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[14] Given the substantial inflation of the past two decades, the State levy of less than six per cent on fixed assets, and the interest charge on borrowed funds are not sufficiently great to serve to ration investment funds.

[15] Mundlak, op. cit., p. 146.

between the inputs and U "simultaneous equation bias." We next give a brief description of the theory underlying the various estimators used.

Change notation so that upper case letters denote natural logarithms, temporarily suppress the industry and region subscripts, and consider the relationship (1.4) and (1.6). We then have the following equations corresponding to (1.4) and (1.6):

$$\text{(1.4a)} \quad Y_{ts} = a_{ts} + \alpha K_{ts} + \beta K_{ts}$$

$$\text{(1.6a)} \quad E_{ts} = H_t + U_{ts}$$

Temporal bias, the H_t effect, may be eliminated by using "covariance estimates."[16] A straightforward application of the covariance technique involves defining dummy time variables and estimating their coefficients which are unbiased estimates of $\overline{H}_t$. If one is not interested in knowing the values of H_t, but only in obtaining unbiased estimates of α and β, the same result may be obtained by defining the six variables of (1.4a) and (1.6a) as deviations from their annual means. Denoting annual deviates by lower case letters, we have, for example,

$$y_{ts} = Y_{ts} - Y_t,$$

where Y_t is a simple average taken over the 12 size categories. If we use the annual deviates

$$k_{ts}, \quad \ell_{ts} \text{ and } y_{ts}$$

in (1.4a), then h_t is eliminated from (1.6a) and e_{ts} equals u_{ts}.[17]

This transformation, however, still does not remove the simultaneous equation bias which may be present if there is correlation between either k_{ts}

[16]For a discussion of the general theory of covariance estimators, see Henry Scheffe, The Analysis of Variance (New York: John Wiley & Son, 1959), pp. 192-220.

[17]We are free to paramaterize our model so that $\Sigma h_t = h. = 0$.

or ℓ_{ts} and u_{ts}. Given our inability to specify a simultaneous equation model, we instead use the single equation techniques of grouping and instrumental variables to ameliorate this effect. The consequences of grouping firms in the cross section data according to the size of employments or fixed assets is discussed later in Section II. The technique of instrumental variables and its derivatives is discussed next.

The instrumental variables used are the lagged values of the independent variables $k_{t-1,s}$ and $\ell_{t-1,s}$. The standard technique is treated in any of the textbooks on econometrics and needs no description here. In addition to the standard estimator, however, we also use a hybrid proposed by Mundlak[18] which requires some explanation. The Mundlak estimator is a combination of three estimators: the ordinary least squares estimator obtained from (1.4a) and (1.6a), denoted by ($\bar{\alpha}, \bar{\beta}$); the covariance estimator denoted by ($\hat{\alpha}$, $\hat{\beta}$) and the instrumental variable estimator obtained by using $K_{t-1,s}$ and $L_{t-1,s}$ as instruments for K_{ts} and L_{ts}, and denoted by ($\tilde{\alpha}$, $\tilde{\beta}$).[19]

Defining the covariance matrix of the independent variables for the estimators by $\bar{A}$, $\hat{A}$ and $\tilde{A}$, we have:

$$\bar{A} = \begin{bmatrix} K' \\ L' \end{bmatrix} (K,L),$$

$$\hat{A} = \begin{bmatrix} k' \\ \ell' \end{bmatrix} (k,\ell)$$

$$\tilde{A} = \begin{bmatrix} K'_{-1} \\ L'_{-1} \end{bmatrix} (K,L).$$

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[18] Ibid., pp. 160-163.

[19] If one is willing to concede our argument that no correlation exists between capital and the error term, then only labor need be used as an instrument. Estimators using only one instrumental variable, labor, are called Type 1; estimators using two are called Type 2.

between the inputs and U "simultaneous equation bias." We next give a brief description of the theory underlying the various estimators used.

Change notation so that upper case letters denote natural logarithms, temporarily suppress the industry and region subscripts, and consider the relationship (1.4) and (1.6). We then have the following equations corresponding to (1.4) and (1.6):

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where Y_t is a simple average taken over the 12 size categories. If we use the annual deviates

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in (1.4a), then h_t is eliminated from (1.6a) and e_{ts} equals u_{ts}.[17]

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[16]For a discussion of the general theory of covariance estimators, see Henry Scheffe, The Analysis of Variance (New York: John Wiley & Son, 1959), pp. 192-220.

[17]We are free to paramaterize our model so that $\Sigma h_t = h. = 0$.

where Y, K, L, k, ℓ, K_{-1}, L_{-1}, are N x 1 vestors of observation. The corresponding least squares parameter estimates are then

$$\begin{bmatrix} \bar{\alpha} \\ \bar{\beta} \end{bmatrix} = \bar{A}^{-1} \begin{bmatrix} K' \\ L' \end{bmatrix} Y, \quad \underline{\text{Simple Least Squares Estimator}}$$

$$\begin{bmatrix} \hat{\alpha} \\ \hat{\beta} \end{bmatrix} = \hat{A}^{-1} \begin{bmatrix} k' \\ \ell' \end{bmatrix} y, \quad \underline{\text{Covariance Estimator}}$$

$$\begin{bmatrix} \tilde{\alpha} \\ \tilde{\beta} \end{bmatrix} = \tilde{A}^{-1} \begin{bmatrix} K'_{-1} \\ L'_{-1} \end{bmatrix} Y. \quad \underline{\text{Instrumental Variables Estimator,}}$$

Type 2 (Both capital and labor used as instruments)

The Mundlak estimator $(\hat{\hat{\alpha}}, \hat{\hat{\beta}})$ is defined by

$$\begin{bmatrix} \hat{\hat{\alpha}} \\ \hat{\hat{\beta}} \end{bmatrix} = \hat{\hat{A}}^{-1} \begin{bmatrix} K'-k'-K'_{-1} \\ L'-\ell'-L'_{-1} \end{bmatrix} Y. \quad \underline{\text{Mundlak Estimator, Type 2}}$$

where

$$\hat{\hat{A}} = \begin{bmatrix} K'-k'-K'_{-1} \\ L'-\ell'-L'_{-1} \end{bmatrix} (K-k-K_{-1},\ L-\ell-L_{-1}).$$

That is, the variables from (1.4a) and (1.6a) are corrected to remove both temporal and simultaneous equation bias, but they still utilize the full range of the original data, which is present in the simple least squares estimator.

Although not unbiased, the Mundlak estimators are consistent under the assumption of profit maximization if two conditions are satisfied: one is that temporal changes in the prices of capital or labor and output are not correlated with the time effects, H_t; and other is that changes in H_t over time are independent of the level of H_t. Even if we grant profit maximization, can we really expect these two subsidiary conditions to hold? From sheer ignorance, agnosticism concerning the latter condition might be granted; however, the former conditions, particularly the presumed independence of the wage rate and temporal effects, is not apt to be so easily obtained. One important contributor to H_t for the cross-section data is change in price of outputs (non-deflated output data is used). It is difficult to be confident that in either an Illyrian or Capitalistic Economy changes in wages are independent of changes in the price of outputs. These uncertainties must raise doubts about the Mundlak Estimator, both Type 1 and Type 2. These estimators are nevertheless included because they promise to be more efficient than other estimators with comparable bias. A less biased, less efficient estimator is discussed next.

One method of eliminating temporal and simultaneous equation bias is to use the combined estimator (α, β) which we call a covariance/instrumental estimator and which is given by

$$\begin{bmatrix} \check{\alpha} \\ \check{\beta} \end{bmatrix} = \check{A}^{-1} \begin{bmatrix} k'_{-1} \\ \ell'_{-1} \end{bmatrix} y, \qquad \underline{\text{Covariance/Instrumental Estimator, Type 2}}$$

where

$$\check{A} = \begin{bmatrix} k'_{-1} \\ \ell'_{-1} \end{bmatrix} [k, \ell].$$

While this estimator is unbiased, it loses efficiency because all the lower case variables, being mean deviates, have a smaller range of values than does the original data. The Mundlak estimator improves efficiency by utilizing the full range of the original data. With the exception of what we will call a Reverse Covariance Estimator (described below on page 33), we have now introduced all the candidates.

How does the econometrician choose? The basic choice is between bias and efficiency, but even that choice is complicated by the existence of alternative model specifications; most importantly, should capital be assumed independent of the error term. Our very crude procedure is first, in advance of computing the estimates, to rank the estimators according to their expected freedom from bias; second, define error measures that can be applied to the estimates to judge how well they meet other a priori conditions we impose; and third, search among the estimates to find one that has an acceptable combination of freedom from bias and error. It is to be expected that freedom from bias and freedom from error will be inversely related.

Prior to attempting a ranking of the estimators, according to freedom from bias both the simple least squares and instrumental variable estimators may be completely eliminated as unacceptable. These estimators do not eliminate the temporal bias, H_t. Since the cross section data is not price deflated, H_t will introduce significant bias unless some form of covariance estimator is used. We suggest the following ranking of the remaining estimators as a rough indicator of their freedom from bias: if we assume capital and the error terms are not correlated,

A1. Reverse Covariance

A2. Covariance/Instrumental, Type 1

A3. Mundlak, Type 1

A4. Covariance;

and if we assume capital and the error term are correlated,

B1. Covariance/Instrumental, Type 2

B2. Mundlak, Type 2

B3. Covariance

B4. Reverse Covariance.

No extended defense of these lists is planned or possible. Note, however that it would be unadmissably inefficient to use Type 2 estimators under the A classification, and it would introduce inadmissable bias to use Type 1 estimators under the B classification. For reasons already explained covariance/

instrumental is superior to Mundlak, and with some trepidation, we place covariance after Mundlak. The reason why reverse covariance dominates the A classification is explained later.

Having obtained a ranking on the criterion of minimum bias, we must next define measures that indicate the extent to which an estimator violates the *a priori* side conditions we wish to impose. Violation of these side conditions may be taken as evidence that low efficiency and resulting high standard errors are at fault, or simply that an unacceptable degree of bias is present. The weakest such condition is that parameter values be positive, slightly stronger is the condition that they be both positive and statistically significant. A simple count of both these conditions over the 2 x 19 parameter estimates computed for each estimator provides the best measure. If one is willing to assume profit maximization and perfect competition, it is also meaningful to compute a coefficient of variation for the marginal products of each input for each estimator. High values of the coefficient of variation would be indicative of low efficiency in the estimator. We do compute coefficients of variation for two estimators, but more from curiosity than conviction. In summary, we seek the estimator that promises minimum bias, and which does not generate an unacceptable number of non-positive parameter estimates.

PART II

CROSS-SECTION ESTIMATES OF LABOR AND CAPITAL OUTPUT ELASTICITIES

INTRODUCTION

Our first task is to use the 1963 and 1964 cross-section data to estimate output elasticities for capital and labor. The objective is to obtain from this data unbiased, or at least consistent, estimates of output elasticities which will later be used as extraneous estimators in the time series analysis. A general discussion of the statistical model has been given. However, peculiarities of the grouped, cross-section data require modification of the estimators presented on pages 22 to 24 in order to increase efficiency. Toward that end consider equation (2.1):

$$(2.1) \quad Y_{its} = a_{its} + \alpha_i K_{its} + \beta_i L_{its} + H_{it} + U_{its}$$

where $i = 1 \ldots 19$; $t = 1962, 1963, 1964$; $s = 1 \ldots 12$. All of the variables are described earlier, but note that no attempt is made to estimate technological progress in this model. The shift parameter a_{its} includes the effects not only of technological change, but also of annual changes in the prices of output, and in the prices of increments to the capital stock. It is an assumption of the analysis that equal output prices prevail for all firms in an industry. Actually, a somewhat less strict condition is sufficient: the average output price for all firms in each size group is the same. A similar condition is assumed for the price of increments to the capital stock. Although there was an extensive re-valorization of fixed assets in 1962, the 1963 and 1964 investments are in current prices. We must, therefore, presume that changes in the price of investment goods between 1962 and 1964 do not importantly disturb the distribution of the capital stock which is correctly measured for 1962. Also concerning the capital stock, it is presumed that the different size categories all have the same ratio for equipment to structures so that the average length of life of capital goods for the different categories is the same.

To give the reader a better feel for the data, Table 3 presents for the year 1964 a sample of the data which we have available for each of the 19 industry aggregates defined in Table 1. The particular industry used in Table 3 is the most aggregate one available--that for the total productive part of the social sector. The most notable feature of this data is that the same set of firms is available by two different groupings: one grouping according to the number of employees, and the other according to the value of fixed assets. (The Statistics are also available, grouped according to gross value added and net value added; however, as will shortly be demonstrated, this information is superfluous since we only need data grouped according to each of the independent variables of the analysis.) Another feature is that the data in the tables is a summation over all the firms in each size category; therefore, in order to convert these observations into the per firm measures of equation (2.1), it is necessary to divide each column of variables by the number of firms in that category. Since the number of firms varies from category to category, efficient least squares estimation requires, regardless of which estimator we use, that the estimates should be based upon a weighted regression with the weights being the square root of the number of firms.[20] Throughout the analysis of the cross-section data, the square root of the number of firms is used as a weight unless otherwise specified.

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[20]Edmund Malinvaud, Statistical Methods of Econometrics, (Chicago: Rand McNally & Co., 1966), pp. 242-246.

The existence of four sets of data according to four different grouping variables for the same industry and year presents at first glance a difficult decision--which grouping should be used. Fortunately, this question has been extensively investigated by Yoel Haitovsky.[21] Haitovsky shows that when separate groupings are available by each of the independent variables it is more efficient to compute an estimate using all of the tables than to rely upon any one of them. This combined regression can be described in the following way: compute mis-specified, separate regressions of the dependent variable on each one of the independent variables separately, using only the table of data grouped according to that independent variable; then combine these mis-specified regressions with correction terms that remove the bias caused by the mis-specifications. Although it is not our intention to reproduce all of Haitovsky's derivation, it is necessary to outline his methods since we extend this work to include instrumental variables, Mundlak reverse, and covariance estimators.

Consider the simplified version of our regression problem given by equation (2.2). Lower case letters indicate that all variables are annual mean deviates so that there is no intercept term, we also assume that ϵ is independent of both of the inputs. Instead of first selecting one set of grouped data for fitting equation (2.2), we fit the two separate mis-specified regressions given by (2.3). The first equation of (2.3) is fitted to the data from the capital grouping only; henceforth we refer to this as grouping 1; and the second equation is fitted to the data from the employment grouping only;

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[21] Yoel Haitovsky, "Unbiased Multiple Regression Coefficients Estimated from One Way Classification Tables When the Cross Classifications are Unknown," The Journal of the American Statistical Association, Sept. 1966, Vol. 61, No. 315, pp. 720-728. This article is a revised version of Chapter 1 of the author's Ph.D. thesis presented to the Department of Economics, Harvard University.

henceforth grouping 2. Denoting the mis-specified estimates by bars, their least squares formula is given by (2.4).[22]

Taking the expectations of ($\overline{\alpha\beta}$), we discover that they equal the unbiased estimates of the correctly specified covariance model (2.2), which we denote by ($\hat{\alpha}$, $\hat{\beta}$), plus an error bias term. This is expressed in (2.5). We may now substitute (2.4) into (2.5) and solve for the vector of unbiased estimates, thereby obtaining (2.6). Haitovsky obtains the variances of ($\hat{\alpha}$, $\hat{\beta}$) in a similar manner.

A simple extension of this procedure obtains instrumental variable estimators. In the case under consideration we use lagged values of capital and labor as instruments. If we denote the unbiased instrumental variable estimates corresponding to equation (2.1) by ($\tilde{\alpha}$, $\tilde{\beta}$) we have (2.7). The Mundlak estimator is obtained in a similar way, denoted by ($\hat{\hat{\alpha}}$, $\hat{\hat{\beta}}$) and presented in equation (2.8).

The reverse covariance estimator must still be defined. We do so by simply changing the table subscripts in equation (2.6). This means, in terms of (2.4), that we estimate the capital coefficient from the labor table, and the labor coefficient from the capital table. The reverse covariance estimator is obviously less efficient than the ordinary covariance estimator, but might it be less biased?

To answer this let (α^*, β^*) denote the reverse covariance estimator. Our earlier ranking of estimators implied that reverse covariance is most bias-free if it is assumed that capital and the error term are not correlated, while labor and the error term are correlated. To prove this assertion,

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[22] In these formulas, the 1 or the 2 after the summation sign Σ indicates the Table, or equivalently, grouping basis, that is to be used in the summation. Thus we see that $\bar{\alpha}$ is estimated solely from the data according to the first grouping, the capital basis, while $\bar{\beta}$ is estimated solely from the data according to the labor grouping.

calculate the expected value of the mis-specified regressions for both the ordinary and reverse covariance estimators. This is done in equation (2.9) where $(\bar{\alpha}, \bar{\beta})$ is the mis-specified ordinary covariance estimator, and $(\bar{\alpha}^*, \bar{\beta}^*)$ is its reverse covariance counterpart.

$$(2.2) \qquad y_s = \alpha k_s + \beta \ell_s + E_s$$

$$(2.3) \qquad y_s = \bar{\alpha} k_s + E_{1s}$$

$$y_s = \bar{\beta} \ell_s + E_{2s}$$

$$(2.4) \qquad \bar{\alpha} = \frac{\Sigma_1 yk}{\Sigma_1 k^2}$$

$$\bar{\beta} = \frac{\Sigma_2 y\ell}{\Sigma_2 \ell^2}$$

$$(2.5) \qquad \bar{\alpha} = \hat{\alpha} + \hat{\beta} \frac{\Sigma_1 k\ell}{\Sigma_1 k^2}$$

$$\bar{\beta} = \hat{\alpha} \frac{\Sigma_2 k\ell}{\Sigma_2 \ell^2} + \hat{\beta}$$

$$(2.6) \qquad \begin{bmatrix} \hat{\alpha} \\ \hat{\beta} \end{bmatrix} = \begin{bmatrix} \Sigma_1 k^2 & \Sigma_1 k\ell \\ \Sigma_2 k\ell & \ell^2 \end{bmatrix}^{-1} \begin{bmatrix} \Sigma_1 yk \\ \Sigma_2 y\ell \end{bmatrix}$$

Ordinary Least Squares Estimator

$$(2.7) \qquad \begin{bmatrix} \tilde{\alpha} \\ \tilde{\beta} \end{bmatrix} = \begin{bmatrix} \Sigma_1 kk_{-1} & \Sigma_1 \ell k_{-1} \\ \Sigma_2 k\ell_{-1} & \Sigma_2 \ell\ell_{-1} \end{bmatrix} \begin{bmatrix} \Sigma_1 yk_{-1} \\ \Sigma_2 y\ell_{-1} \end{bmatrix}$$

Covariance/Instrumental Estimator, Type 2

$$(2.8) \qquad \begin{bmatrix} \hat{\hat{\alpha}} \\ \hat{\hat{\beta}} \end{bmatrix} \begin{bmatrix} \Sigma_1 (K^2 - k^2 - KK_{-1}) \\ \Sigma_2 (KL - k\ell - KL_{-1}) \end{bmatrix} \begin{bmatrix} \Sigma_1 (LK - \ell k - LK_{-1}) \\ \Sigma_2 (L^2 - \ell^2 - LL_{-1}) \end{bmatrix} \begin{bmatrix} \Sigma_1 (YK - yk - YK_{-1}) \\ \Sigma_2 (YL - y\ell - YL_{-1}) \end{bmatrix}$$

Mundlak Estimat[illegible] Type 2

$$(2.9) \qquad E(\bar{\alpha}) = \alpha + \beta \frac{\Sigma_1 k\ell}{\Sigma_1 k^2} \quad E\left(\frac{\Sigma_1 kE}{\Sigma_1 k^2}\right)$$

$$E(\beta) = \alpha \frac{\Sigma_2 k\ell}{\Sigma_2 \ell^2} + \beta + E\left(\frac{\Sigma_2 \ell E}{\Sigma_2 \ell^2}\right)$$

$$E(\alpha^*) = \alpha + \beta \frac{\Sigma_2 k\ell}{\Sigma_2 k^2} \quad E\left(\frac{\Sigma_2 kE}{\Sigma_2 k^2}\right)$$

$$E(\beta^*) = \alpha \frac{\Sigma_1 k\ell}{\Sigma_1 \ell^2} + \beta + E\left(\frac{\Sigma_1 \ell E}{\Sigma_1 \ell^2}\right)$$

If we assume that capital and the error term are not correlated but that labor and the error term are correlated, this gives

$$E(\Sigma_1 k\varepsilon) = E(\Sigma_2 k\varepsilon) = 0,$$

$$\text{and} \quad E(\Sigma_2 \ell\varepsilon) \neq 0.$$

But what about $E(\Sigma_2 \ell\varepsilon)$? While it might seem that the presumed correlation between ℓ and ε would make $E(\Sigma_1 \ell\varepsilon) \neq 0$, this is not correct. When using grouped data, if the grouping variable is itself independent of the error term, it may serve as an instrument to purge any other variables in that table of correlation with ε.[23] Immediately we see that all variables in the capital table, Table 1, are free of such correlation, and particularly $E(\Sigma_1 \ell\varepsilon) = 0$. This means that under the assumptions

$$E(k\varepsilon) = 0$$

$$E(\ell\varepsilon) \neq 0,$$

the covariance estimator (2.6) is subject to simultaneous equation bias,

[23] See the discussion by Malinvaud, op. cit., pp. 242-246.

but the corresponding reverse covariance estimator obtained by reversing the table subscripts is free of bias. This is why the reverse covariance estimator heads the A ranking of estimators. Of course, the reverse covariance estimator is less efficient.[24]

COMPARISON OF THE CROSS-SECTION ESTIMATES

We begin our inspection in Table 4 by looking at estimates computed for only two sectors of the economy: the total social sector, and industry and mining. These sectors are the largest in the economy and both are aggregates of other branches whose parameters are estimated. Restricting attention to these two sectors enables us to focus on the sensitivity of the estimates to several sources of variation, specifically: variations in the regression weights; variation in the years for which the regression is run; and variation in the number of cells in the different size groupings.

While certain elements of Table 4 are not available because of lack of data, other elements are purposely omitted because, at an early state it became apparent that some variants were so ill-behaved that they would not be contenders for ultimate selections. Consequently, limited resources forced their exclusion. For example, Part B of the Table which uses the number of firms as weights in the regressions has a number of empty cells because the arguments in favor of square root of the number of firms as weights made it clear that the latter would finally be selected. Our inclusion here of the number of firms as weights is done to test the sensitivity of the results to

[24] A related bias-free estimator could be obtained by using ordinary covariance applied only to one table, the capital table. However, experiments not reported here revealed this estimator to be less attractive than the two table reverse covariance estimators described above.

TABLE 3 - SAMPLE CROSS-SECTION DATA
TOTAL SOCIAL SECTOR, 1964

EMPLOYMENT BASIS

	Unit of Measure	Total	Less than 6 Employees	7-15	16-29	30-60	61-125	126-250	251-500	501-1000	1001-2000	2001-3000	3001-4000	Over 4000 Employees
Number of firms	No.	14870	1753	1788	1919	2578	2589	1831	1216	622	365	96	54	59
Employment - annual average	thousands	2915	5	19	42	111	228	322	426	431	501	231	185	409
Gross Fixed Assets (Revalorized in 1962)	bil. din.	8962	8	23	62	198	477	785	1104	1147	1517	844	660	2132
Value Added (Current prices)	bil. din.	4857	10	27	60	162	351	534	688	705	838	423	306	748

CAPITAL BASIS

	Unit of Measure	Total	Less than 0.5 mil.din.	0.5-1.5	1.5-2.5	2.5-5	5-15	15-50	50-150	150-500	500-1500	1500-5000	5000-15000	Over 15000 mil.dia.
. Number of firms	No.	14870	990	788	464	803	1799	2941	2865	2187	1178	568	180	107
. Employment - annual average	thousands	2915	7	7	6	14	51	155	303	461	546	613	360	387
. Gross Fixed Assets (Revalorized in 1962)	bil. din.	8962	0.1	0.7	0.9	2	16	87	257	603	1005	1514	1515	3956
. Value Added (Current prices)	bil. din.	4857	7	8	6	17	63	211	427	701	856	1014	683	858

TABLE 4

AGGREGATE ESTIMATES: 1963-64†

Estimator	Total Social Sector 12 Cells α	β	α+β	Industry and Mining 12 Cells α	β	α+β	Industry and Mining 9 Cells α	β	α+β
A. 1963-64 with Square Root Weights*									
1. Reverse covariance: 1963-64	.12	.89	1.01	.13	.89	1.02	.16	.83	.99
2. Covariance/Instrumental, Type 2	.14	.88	1.02	.14	.88	1.02	.18	.81	.99
3. Covariance/Instrumental, Type 1	.16	.85	1.01	.14	.88	1.02	.19	.80	.99
4. Mundlak, Type 2	.09	.95	1.04	.15	.89	1.04	.16	.84	1.01
5. Mundlak, Type 1	.13	.89	1.02	.17	.85	1.02	.19	.80	.99
6. Covariance: 1963-64	.13	.89	1.02	.13	.89	1.02	.15	.84	.99
B. 1963-64 with Firm Weights*									
1. Reverse covariance: 1963-64				omitted					
2. Covariance/Instrumental, Type 2				omitted					
3. Covariance/Instrumental, Type 1	.12	.88	1.00	.10	.89	.99		omitted	
4. Mundlak, Type 2	.11	.91	1.02	.12	.90	1.02	.16	.87	1.03
5. Mundlak, Type 1	.12	.88	1.00	.15	.85	1.00	.19	.80	.99
6a. Covariance: 1963-64	.12	.88	1.00	.10	.89	.99	.14	.86	1.00
6b. Covariance: 1962-64	.12	.89	1.01	.07	.93	1.00		omitted	
C. 1963-67 with Square Root Weights*									
1. Reverse covariance: 1963-64							.11	.84	.95
2. Covariance/Instrumental, Type 2							.13	.82	.95
3. Covariance/Instrumental, Type 1							.14	.81	.95
4. Mundlak, Type 2							-.02	.97	.95
5. Mundlak, Type 1			not available				-.02	.98	.96
6 Covariance: 1963-64							.10	.85	.95

*Part B uses the number of firms per cell as a regression weight. Parts A and C use the square root of the number of firms.

†All covariance/instrumental and covariance parameters are significantly positive at a confidence level of .95. Standard errors of the estimates are not known for Mundlak estimators.

Consider first not the two input coefficients, but their sum, the scale coefficient. As would be expected, the scale coefficient shows greater stability than either of its components, α or β. Generally, all of the results from the 12-cell data show returns to scale very close to unity. Excluding Section C, the range of the scale coefficient for both industry and mining and the total social sector is from .99 to 1.04 with a median value around 1.01 or 1.02. These values are not statistically significantly different from unity to allow rejection of the hypothesis of constant returns to scale. In none of the results, however, is the scale coefficient forced to be unity; the presence of high multi-collinearity can cause this specification to explosively affect the estimates of the capital and labor coefficients. It is interesting that when square root weights are used, the 9-cell data consistently gives lower estimates of the scale coefficients. The difference in each case is exactly 3 percentage points. A much greater difference in the scale coefficients is found in the 9-cell, 1963-67 regional data using square root weights (Part C). Comparing this data with the 9-cell estimates from Section A, there is again a consistent difference, this time of 4 percentage points. We do not know why the 1963-67 data shows an important indication of decreasing returns to scale with a value of .95 but we would speculate that since this time period straddles the 1965 price reform it is possible that the rather dramatic changes in prices which occurred during that reform affected the large firms, which were under closer government surveillance, more negatively than it affected the small firms. If this is actually the case, it would explain the dramatic shift to decreasing returns to scale which is brought about by including the post-reform years. In any event, the significant alteration of the scale coefficient which occurs when we add these years validates our restricting attention to only the pre-reform years, thus assuring a more homogeneous sample with respect to prices, institutions, and behavior.

The labor coefficient estimates are in the high .80's for all of the 12-cell data for either the total social sector of industry and mining. For the 9-cell data, however, it is substantially less, somewhere in the low .80's. Correspondingly, the capital coefficient, α , tends to lie in the low teens for the 12-cell data, and in the high teens for the 9-cell data. In Section C, the two capital coefficients according to the Mundlak estimators are slightly negative. The magnitude of these negative values suggests violation of the Mundlak assumptions in the longer time period rather than a distortion due to sampling. We now turn to a consideration of parameter sensitivity from the point of view of the estimators rather than the data sample.

Except for the Mundlak estimators whose variance is not known and for which two coefficients are negative, the other estimators all generate coefficients that are statistically significant and positive. In order to establish the importance or unimportance of the correlation between capital and the error term, we contrast the Type 1 and Type 2 estimates for the covariance/instrumental and Mundlak estimators. For these two estimators, the use of both capital and labor as instruments reduces the capital coefficient and raises the labor coefficient by from 1 to 4 points. This is a very consistent result. However, it should not be interpreted to mean that the introduction of capital as an instrumental variable has removed any significant bias, rather it is more likely that the consistent change of the parameters by a few points is due simply to the less-than-perfect correlation which exists between lagged capital and current capital. This causes labor to have a relatively more improved correlation with output than does capital. In any event, the differences are not large so that by selecting the Type 1 estimators we risk little.

At this point, along with the Type 2 estimators, we also discard the Mundlak estimators. The presence of the two negative capital coefficients indicates that the assumptions of that estimator are not met. If we compare the covariance/instrumental Type 1 estimators with either the ordinary covariance or reverse covariance estimators, we find that the former seems to yield a higher capital coefficient estimate and a lower labor estimate. Here again, this result can be explained by the less-than-perfect correlation which exists between lagged labor and current labor. This would cause the labor coefficient for the covariance/instrumental, Type 1 estimator to be smaller than that for either of the covariance estimators.

The most interesting comparison is between the covariance and the reverse covariance estimators. Under our preferred assumption that capital and the error term are not correlated, the reverse covariance estimator offers the best available means of removing bias caused by a correlation between labor and the error term. The reverse covariance estimator is superior in this respect to instrumental variable estimators because the latter cannot remove such correlations if the errors affecting the variables are associated through time. Therefore, a comparison of the covariance and the reverse covariance estimators provides our best method for judging the importance of the bias generated by a possible correlation between labor and the error term. The result is surprising.

There are four blocks of data for which the two estimators may be compared. For these four blocks, none of the parameter estimates differs by more than one percentage point, signifying that virtually identical results are achieved whether we use reverse covariance or covariance estimators. The conclusion must be that simultaneous equation bias resulting from a correlation between labor and the error term does not exist, at least not under the assumptions of the model. This also means that there is no reason for further considering the instrumental/covariance Type 1 estimators. The final comparison must be between reverse covariance, which has minimum bias, and ordinary covariance, which gives the same estimates for aggregate sectors but is more efficient. To select between these two we compare results for all nineteen sectors and five regions. First, however, a one-paragraph summary is given of the findings to this point.

The greatest economic import of Table 3 attaches to the consistency with which we find returns to scale of approximately unity. Typical values of the capital and labor coefficients are .15 and .85. This contrasts significantly with the .25 and .75 values that are typically asserted for western economies. Of course, this has little real meaning until we examine the marginal products and income share in Yugoslavia. The greatest statistical import of Table 3 is that the estimates are quite stable for the six estimators we try, and also for the various data samples used. The largest change in estimates occurs when we go from the 12-cell data to the 9-cell data which implies that consolidation of the extremes of the data may be dangerous. The similar results given by all the estimators, but particularly the nearly identical results for the ordinary and reverse covariance estimators is evidence that simultaneous equation bias is not important.

So far we have established that the reverse covariance estimator is apt to be most bias-free, but that in practice, for the large aggregate sectors, there is almost no difference in the estimates for reverse covariance and ordinary covariance. Since the ordinary covariance estimators are more efficient they would seem to be superior. Estimates for the nineteen sectors confirm this judgment. Table 5 presents the capital, labor and scale coefficients for three estimators; ordinary covariance; reverse covariance; and covariance/instrumental, Type 1. In those cases where an estimators is not significantly

TABLE 5

SECTORAL ELASTICITY ESTIMATES FOR 1963-64

onomic Growth Center Sector		Covariance/Instrumental, Type 1			Ordinary Covariance			Reverse Covariance		
		α	β	α+β	α	β	α+β	α	β	α+β
tal Social Sector	(000)	.16	.85	1.01	.13	.89	1.02	.12	.89	1.01
dustry and Mining	(001)	.14	.88	1.02	.13	.89	1.02	.13	.89	1.02
griculture	(002)	.11	.87	.98	.10	.88	.98	.12	.86	.98
onstruction with size effect	(003)	.20	.60	.80	.11 .24	.71 .69	.82 .93	-.00 (.671)	.84	.84
ransportation & Communication	(004)	.21	.74	.95	.18	.77	.95	.16	.82	.98
andicrafts	(005)	.20	.79	.99	.16	.84	1.00	.16	.84	1.00
rade & Miscellaneous	(006)	.21	.77	.98	.20	.78	.98	.20	.78	.98
lectricity	(111)	.29	.72	1.01	.29	.72	1.01	-.19 (.441)	1.59	1.40
oal & Coal Mining	(112)	.29	.76	1.05	.31	.74	1.05	.28	.79	1.07
ood, Drink & Tobacco	(113)	-.01 (.024)	1.14	1.13	.09	1.05	1.14	.12	1.01	1.13
extiles & Clothing	(114)	.08	.99	1.07	.14	.92	1.06	.10	.98	1.08
imber & Furniture	(115)	.24	.75	.99	.23	.75	.98	.16	.86	1.02
Paper, Printing & Publishing	(116)	.17	.81	.98	.16	.81	.97	.12	.89	1.01
Leather, Rubber & Footwear	(117)	.28	.83	1.11	.18	.92	1.10	.16	.96	1.12
Stone, Clay & Glass	(118)	.26	.82	1,08	.23	.86	1.09	.26	.82	1.08
Chemicals & Petroleum	(119)	.35	.69	1.04	.29	.77	1.06	.38	.61	.99
Metal Using	(120)	.18	.93	1.11	.12	1.00	1.12	.09	1.03	1.12
Metal Making	(121)	.26	.85	1.11	.10	1.04	1.15	.05 (133)	1.11	1.16
Miscellaneous	(122)	.07 (.038)	.78	.85	.15	.69	.84	.04 (.061)	.86	.90

positive at a .95 confidence level, the standard error of that coefficient is presented in parentheses. For the ordinary covariance estimator there is no coefficient in this table that is either negative or not significantly positive. In contrast, the reverse covariance estimator exhibits two negative values and four insignificantly positive values, while the covariance/instrumental, Type 1 estimator shows one negative value and one insignificantly positive value. One explanation of this is found in the standard errors of the coefficients.[25] Typically, the standard errors for ordinary covariance are two-thirds to one-half those for reverse covariance or instrumental/covariance.

In other regards, the conclusions of Table 4 hold for the disaggregate sectors of Table 5. Returns to scale are not importantly different from unity, although a number of the sub-branches of industry do show increasing returns to scale, particularly food, drink and tobacco (113), and metal making and using (120 and 121). The capital coefficient is again in the teens, although the high teens rather than the low teens seem to be more characteristic. And the labor coefficient is generally in the high 80's. Two industries show significant decreasing returns to scale: construction (003) and the miscellaneous sub-branch of industry (122). In both these cases, there are special circumstances at work and better estimates, described later, are presented in bold type.

The same data for industry and mining, but covering the five regions and presented in Table 6, shows similar results in all respects, except there are no negative or insignificantly positive values for either ordinary covariance or covariance/instrumental estimates. There is one negative and insignificantly

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[25] Tables for standard errors are not presented because the paper is already overburdened with statistical measures.

TABLE 6

REGIONAL ELASTICITY ESTIMATES
FOR INDUSTRY AND MINING*

Region	Covariance/Instrumental, Type 1			Ordinary Covariance			Reverse Covariance		
	α	β	α+β	α	β	α+β	α	β	α+β
				Year from 1963 to 1964					
Yugoslavia	.19	.80	.99	.15	.84	.99	.16	.83	.99
North	.17	.86	1.03	.10	.93	1.03	.08	.96	1.04
South	.14	.80	.94	.14	.81	.95	.31	.62	.93
Serbia Proper	.28	.65	.93	.28	.64	.92	.27	.66	.93
South less Serbia Proper	.11	.92	1.03	.03	1.01	1.04	.05	.99	1.04
				Year from 1963 to 1967					
Yugoslavia	.14	.81	.95	.10	.85	.95	.11	.84	.95
North	.07	.92	.99	.03	.96	.99	-.03 (.036)	1.05	1.02
South	.15	.78	.93	.11	.83	.94	.16	.76	.92
Serbia Proper	.18	.73	.91	.15	.76	.91	.15	.76	.91
South less Serbia Proper	.19	.79	.98	.14	.84	.98	.15	.82	.97

*All coefficients are significantly positive at a confidence level of .95. The covariance estimates for South less Serbia Proper for 1963-64, and the North for 1963-67, fail at the .975 level, however.

positive value for the reverse covariance estimator. The scale, capital, and labor coefficients, all satisfy reasonably well the standardized description given above. A surprising feature of Table 6 is that for 1963-64, Serbia proper has a very low measure for the labor coefficient and for returns to scale. The statistics for Serbia proper do not look so anamolous in the longer 1963-1967 period both because the scale coefficient for all the other republics except Serbia Proper falls by 5 percentage points, and the Serbia proper capital coefficient loses 13 points while the labor coefficient gains 12 points. The outcome is that for the longer time period Serbia Proper is not so distinctly different from the other regions as it is for the 1963-64 period. The reason for this is not known.

In a pareto optimal economy the marginal products of labor and capital over sectors of the economy and regions are equal. A serious empirical application of this criterion involves many qualifications and modifications; nevertheless, a straightforward, naive comparison is not without merit. At the very least it can be an important indicator of unreasonable results. Table 7 presents the marginal products of capital and labor for the ordinary covariance estimator, and by way of contrast for the covariance/instrumental estimator. Contrasting the two aggregates, the total social sector and industry and mining, we find a good deal more difference can be attributed to the sectoral classification than to the estimator used. For both estimators, the marginal product of capital is significantly greater for the total social sector than it is for industry and mining, while just the reverse is true of the marginal product of labor. Since the control of investments is the strongest instrument in the hands of central policy-makers, this result is consistent with the idea that industry and mining is a priority sector whose growth is made possible by the

TABLE 7

SECTORAL MARGINAL PRODUCT ESTIMATES
FOR 1963-64*

		Covariance/ Instrumental, Type 1		Ordinary Covariance	
		MPK	MPL	MPK	MPL
Total Social Sector	(000)	.19	1.10	.15	1.15
Industry and Mining	(001)	.11	1.32	.10	1.34
Agriculture	(022)	.06	.94	.06	.95
Construction with size effect	(003)	.62	.81	.33	.96
Transportation & Communication	(004)	.10	1.12	.09	1.17
Handicrafts	(005)	.59	.79	.47	.83
Trade & Miscellaneous	(006)	.37	1.11	.35	1.13
Electricity	(111)	.06	2.21	.06	2.22
Coal & Coal Mining	(112)	.12	.76	.13	.74
Food, Drink & Tobacco	(113)	-.01	1.90	.07	1.75
Textiles & Clothing	(114)	.09	1.19	.15	1.10
Timber & Furniture	(115)	.24	.71	.23	.71
Paper, Printing & Publishing	(116)	.25	1.34	.25	1.35
Leather, Rubber & Footwear	(117)	.38	1.13	.25	1.26
Stone, Clay & Glass	(118)	.17	.83	.15	.87
Chemicals & Petroleum	(119)	.37	1.83	.31	2.03
Metal Using	(120)	.19	1.36	.12	1.46
Metal Making	(121)	.13	1.32	.05	1.63
Miscellaneous	(122)	.09	1.34	.20	1.12
V = Coefficient of variation†		79.60	34.20	61.40	34.20

*Marginal Products are computed at the weighted geometric mean. The weights are the square root of the number of firms per cell.

†Computed from the 17 sectors 002 to 122 by the formula $V = 100S/\overline{X}$ where S is the sample standard deviation and $\overline{X}$ is the sample mean.

infusion of large amounts of capital, so much capital that the rate of return is driven below what is available in other sectors. Later, in the section dealing with aggregation problems, the marginal product of capital for both of these two sectors is shown to be biased downward by the process of linear aggregation.

While significance statements are not available for the marginal products, a coefficient of variation can be used to measure the variability of the two estimators for the 17 disaggregate sectors. With a value of 34.2 the coefficient of variation for the marginal product of labor is identical for ordinary covariance and covariance/instrumental, but the coefficient of variation for the marginal products of capital is smaller for ordinary covariance, 61.4, than for covariance/instrumental, 79.6.

Similar data is given in Table 8 for regional marginal products. Again, the regional classification is a much more important determinant of marginal product than is the estimator. Another conclusion is that the marginal product of capital is lower in the North than in the South, while the converse is true for the marginal product of labor. For the marginal product of labor this is to be expected due to the immobility of labor. For the marginal product of capital, however, expectations are not so clear cut. On the one hand, greater efficiency in the North causes average output per unit of capital to be high, which raises marginal productivity; on the other hand, capital deepening has progressed further in the North--the capital/labor ratio is one-third larger than in the South--and this lowers marginal productivity. The fact that the measured product is lower for the North suggests that capital deepening has been carried beyond what is optimal.[26] This conclusion is reversed in the

[26]This conclusion conflicts with that of Dr. James Plummer who finds that capital is used more efficiently in the North than in the South. Our study agrees with his in concluding that some reallocation of labor from South to North would be desirable. James Plummer, "Interfirm Production Function Analysis of Yugoslav Industrial Resource Allocation," mimeograph, Dec. 1969, p. 7.

TABLE 8

REGIONAL MARGINAL PRODUCT ESTIMATES
FOR INDUSTRY AND MINING

Region	Covariance/Instrumental, Type 1		Covariance	
	MPK	MPL	MPK	MPL
Years from 1963 to 1964				
Yugoslavia	.14	1.21	.11	1.27
North	.13	1.37	.08	1.47
South	.14	1.13	.13	1.14
Serbia Proper	.24	.94	.25	.94
South less Serbia Proper	.07	1.24	.02	1.35
Years from 1963 to 1967				
Yugoslavia	.12	1.61	.08	1.69
North	.06	1.90	.02	1.99
South	.13	1.44	.10	1.53
Serbia Proper	.17	1.43	.15	1.49
South less Serbia Proper	.13	1.34	.10	1.43

1963-67 data, but this appears related to the price reforms of 1965.

The really anomolous aspect of Table 9 is the large marginal product of capital for Serbia Proper generated by the 1963-64 data. More than the elasticity measures, the marginal products indicate that this is due to unknown aberrations in the 1963-64 data. The longer 1963-67 period shows values for Serbia Proper that are more in line with our expectations. If the regressions were run only on the 1965-67 sub-sample, the results for Serbia Proper would be substantially closer to those for Yugoslavia as a whole. This leads to the conclusion that the marginal product of capital is low in the North and high in the South, while the converse is true of the marginal product of labor; and that the marginal product of capital and labor are about the same in Serbia Proper and the far South. Again, differences between the 1963-64 and 1963-67 results, weaken such conclusions.

PROBLEMS OF AGGREGATION

The use of several estimators and different data samples increases confidence in the stability of the findings. Similarly, disaggregation by economic sectors and regions can be viewed as a replication of the experiment, a replication that also increases confidence in the stability of the estimates and confirms the existence of a relatively small capital coefficient and returns to scale near unity. This replication by disaggregation, however, burdens us with two issues not yet considered. First, in the time series analysis that follows, great simplification could be achieved if the capital and labor coefficients for any industry were the same for all regions. This hypothesis is easily confirmed or rejected by a "t-test" on the regional differences of the estimates for industry and mining. Second, for industry and mining and for the total social sector there are estimates for both the aggregates and their sub-aggregate components. This raises the question of whether or not the aggregate coefficients for capital or labor are unbiased functions of the sub-aggregate coefficients. If they are not, the difference is called "aggregation bias."[27] We begin with the simpler issue mentioned first, the hypothesis of regional equality.

For industry and mining the nine-cell, regionally disaggregate data may be used to test the hypothesis of regional equality. This is an important and convenient hypothesis, and one that is at times forced upon us. From Table 6, the maximum difference (covariance estimator, 1963-64 data) for the capital coefficient is .25 obtained as the difference between $\hat{\alpha}_4 = .28$ and $\hat{\alpha}_5 = .03$. For the labor coefficient, the maximum difference is obtained for the same category and is .37. Assuming the statistical independence of parameters estimated for different regions, the standard errors are:

$$S_{\hat{\alpha}_4 + \hat{\alpha}_5} = .016$$

and

$$S_{\hat{\beta}_4 + \hat{\beta}_5} = .031$$

The respective "t-statistics" for capital and labor are 15.7 and 11.8. These values are so large we may be assured that a significant difference exists regardless of the problems of multiple comparisons and of serial correlations of the errors which overstate these "t-statistics". (The assumed independence of parameters may understate it.) Even the smaller differences that exist when we compare the North with the South, still generate "t-statistics" of 2.5

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[27] Our discussion of aggregation bias follows R.G.D. Allen, Mathematical Economics (New York: St. Martin's Press, 1957), pp. 694-724.

for capital and 3.7 for labor. With 30 degrees of freedom[28] the critical limits are 2.36 for a significance level of .025, and 2.75 for a significance level of .01. Thus, even the minimum differences tend to be significant. The hypothesis of a regional constancy in the coefficients must be rejected. We next test for aggregation bias.

Table 9 provides a comparison of two estimates of the output elasticities for the total social sector, and industry and mining: the first $(\hat{\alpha}, \hat{\beta})$, is the covariance estimate from Table 3; the second $(\overline{\alpha}, \overline{\beta})$, is obtained as a weighted[29] sum of the sub-aggregates components of the two above sectors, also according to the covariance estimator. Since we reject the hypothesis of regional equality, we may also meaningfully compute the same statistics according to the three-region disaggregation (only for industry and mining, of course). What do these differences show? For the sectoral aggregation, the capital coefficients are importantly smaller by about twenty-five per cent for the "Direct Regression" in comparison to the "Weighted Sum"; and the labor coefficients are only slightly larger for the total social sector by about five percent. The same comparison for the regional aggregate shows the capital coefficient slightly larger for the "direct regression" than for the "weighted sum," and the labor coefficient slightly smaller. What economic interpretation may be given to these differences?

To give an economic interpretation to the difference between the linear estimates $(\hat{\alpha}, \hat{\beta})$ and the geometric estimates $(\overline{\alpha}, \overline{\beta})$, we make the simplifying

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[28]The degrees of freedom are computed on the basis of 18 observations per table (9 cells for 2 years) and six parameters for both tables (capital and labor, and four annual "shift" parameters, two per table). This gives 36-6=30 degrees of freedom; however, since the total number of firms is the same in both tables one cell is redundant so that the final outcome is 35-6=29 degrees of freedom.

[29]The weights are the square roots of the average number of firms in the industry in any year. That is:

$$\left(\sum_{t=1}^{T} N_{it}/T \right)^{1/2}$$

TABLE

TEST FOR AGGREGATION BIAS IN ELASTICITIES

	Direct Regression			Weighted Sum of Sub-Aggregates		
	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha} + \hat{\beta}$	$\bar{\alpha}$	$\bar{\beta}$	$\bar{\alpha} + \bar{\beta}$
Sectoral Aggregation (12-cell):						
Total Social Sector (17 sub-aggregates)	.13	.89	1.02	.17	.83	1.00
Industry and Mining (12 sub-aggregates)	.13	.89	1.02	.18	.87	1.05
Regional Aggregation (9-cell):						
Industry and Mining (3 sub-aggregates)	.15	.84	.99	.13	.87	1.00

assumption of constant returns to scale ($\hat{\alpha} + \hat{\beta} = \bar{\alpha} + \bar{\beta} = 1$).[30] On the basis of this assumption the production function may be expressed as,

$$(2.1) \quad Y^*_{is} = \alpha_i \, k^*_{is})$$

and $\beta_i = 1 - \alpha_i$,

where $Y^*_{is} = Y_{is} - \ell_{is}$,

and $k^*_{is} = k_{is} - \ell_{is}$.

Consider the auxiliary regression.

$$(2.2) \quad k^*_{is} = \delta_{is} \, k^*_s + \lambda_{is}$$

where $k^*_s = \log(\Sigma_i K_{is}) - \log(\Sigma_i L_{is})$, λ_{is} is a stochastic term, and α_{is} is a parameters.

Equation (2.2) expresses how the sub-aggregate capital/labor ratios are related to the aggregate capital/labor ratio for any size category.

The question we ask is, suppose (2.1) expresses the true micro-production function, what relationship will then exist between the α_i of that equation and an aggregate α obtained by first summing each variable over all sectoral sub-aggregates? That is, an α obtained from

$$(2.3) \quad y^*_s = \sum_{i=1}^{I} y^*_{is} = \alpha \sum_{i=1}^{I} k^*_{is} + \varepsilon_s = \alpha \, k^*_s + \varepsilon_s$$

Substituting (2.2) into (2.1) and aggregating, we have

$$(2.4) \quad y^*_s = \left(\sum_{i-1}^{I} \alpha_i \, \delta_{is} \right) k_s + \lambda_s$$

But (2.4) is of the same form as (2.3) so that a covariance estimator obtained from the former variables

$$(2.5) \quad \hat{\alpha} = \sum_{i=1}^{I} \hat{\alpha}_i \, \hat{\delta}_{is}$$

[30] Since the statistical estimates of the scale coefficient for the total social sector and industry and mining differ from unity by only two percentage points, this specification is not arbitrary or misleading.

Furthermore, defining the "sum of sub-aggregates" estimate by

$$\bar{\alpha} = \sum_{i=1}^{I} \hat{\alpha}_i / I,$$

we finally obtain

$$(2.6) \quad \hat{\alpha} = \bar{\alpha} - I \text{ Cov } (\hat{\alpha}_i, \hat{\delta}_{is}).$$

Equation (2.6) answers our original question. Where the "direct regression" estimate, $\hat{\alpha}$, is smaller than the "sum of sub-aggregates" estimate,[31] $\bar{\alpha}$, it implies that Cov$(\hat{\alpha}_i, \hat{\delta}_{is})$ is negative. Or, in more familiar terminology, it implies that industries with large capital coefficients have small capital/labor ratios; and also the obverse, industries with large labor coefficients have large capital/labor coefficients. For the regional estimates, there is a tendency for the opposite results but the magnitude is too small to be important. These results have little meaning, however since it is differences in marginal products that govern the flow of resources.

As revealed in Table 10, the marginal products of labor (MPL) shows no important bias for either sectoral or regional aggregation, and the marginal product of capital (MPK) shows none for regional aggregation. There is, nevertheless, one important case of aggregation bias. For both the total social sector and industry and mining, the "direct regression" yields a MPK that is significantly lower than that produced by the "weighted sum." Application of the aggregation theory in the paragraphs above provides an explanation with economic import. The fact that $\hat{\alpha}$ is smaller than $\bar{\alpha}$ implies that there is a positive correlation between the marginal products and the capital/labor ratios of different industries--industries with high MPK's

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[31]We use a weighted sum in Table 8 to adjust for the fact that weighted regressions are used to obtain α and $\hat{\alpha}_i$.

TABLE 10

TEST FOR AGGREGATION BIAS
IN MARGINAL PRODUCTS*

	Direct Regression MPK	MPL	Weighted Sum of Sub-Aggregates MPK	MPL
Sectoral Aggregation (12-cell):				
Total Social Sector (17 sub-aggregates)	.15	1.15	.23	1.13
Industry and Mining (12 sub-aggregates)	.10	1.34	.17	1.33
Regional Aggregation (9-cell):				
Industry and Mining (3 sub-aggregates)	.11	1.27	.11	1.29

* Marginal products are computed at the geometric mean of the cross-section data for 1963-64.

tend to have high capital/labor ratios. This is generally consistent with the view that profitability is an important criterion determining investment allocation in the Yugoslav economy.

SECTION III

TIME SERIES ESTIMATES OF NEUTRAL TECHNICAL PROGRESS: 1952 to 1964

The publicly available time series data is described in Section I. Before this information can be used for production function analysis, considerable effort must be expended in aggregation, deflation and so forth. So that we may come directly to the results, the description of the steps taken and methods used is relegated to an Appendix. The Appendix also contains a complete publication of the resultant statistical series for value added, employment, total fixed capital and equipment. These series are presented for five regions and nineteen sectors for the years 1952 to 1966.

The time series counterpart of (2.4) is:

$$(3.1)\quad Y_{irt} = a_{ir} + \alpha_{ir}K_{irt} + \beta_{ir}L_{irt} + \lambda_{irt} + E_{irt}$$

where $i = 1 \ldots 19$ industries

$r = 1 \ldots 5$ regions, and

T or $t = 1 \ldots 13$ years from 1952 to 1964.

The variables Y, K and L are in logarithms, and T is in natural integer units. To satisfactorily estimate the neutral technical progress coefficient λ_{ir}, it is necessary to make the assumption

$$(3.2)\quad \alpha_{i1} = \alpha_{i2} \ldots = \alpha_{i5} = \bar{\alpha}_i$$

$$\text{and}\quad \beta_{i1} = \beta_{i2} \ldots = \beta_{i5} = \bar{\beta}_i \quad \text{for all } i,$$

where $\bar{\alpha}_i$ and $\bar{\beta}_i$ are the ordinary covariance estimates obtained from Table 5.

To estimate λ_{ir} we proceed in two steps: first, initial least squares estimates are computed for the coefficients of equation (3.1) without the benefit of the extraneous estimators utilized in assumption (3.2), and second, the capital and labor coefficients are restricted to the values prescribed by (3.2) and new estimates are computed for a_{ir} and λ_{ir}.[32]

The values of $\lambda(1)$ obtained in step 1, and $\lambda(2)$ obtained in step 2, are found in Table 11. Results are presented only for Yugoslavia as a whole. These results strongly favor the $\lambda(2)$ coefficients which is based on the extraneous estimators and restricted regression. The large dispersion of $\lambda(1)$, even including negative values, occurs because the corresponding unrestricted estimates of α and β are highly unstable (values that are negative or greater than 1.5 are common). The high multi-collinearity of the data together with varying amounts of underutilized capacity[33] in both the capital and labor measures makes it impossible to estimate all three coefficients with only time series. The estimates for $\lambda(2)$ are much better. There are no negative values and the range, running 0.9 to 5.9 is not excessive.

Another test of the extraneous estimators is to compute how destructive assumption (3.2) is to the coefficient of multiple determination (R^2). A comparison of columns three and four of Table 11 reveals that only for agriculture (002) is there a large drop when the extraneous estimators are used:

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[32] The same result is achieved by directly computing the single regression, $Y_{irt} - \bar{\alpha}_i K_{irt} - \bar{\beta}_i L_{irt} = a_{ir} + \lambda_{ir} t + E_{irt}$. This, however, would not permit a test of assumption (3.2). The technique of "restricted least squares" is described in Goldberger, op. cit., pp. 256-258.

[33] At this level of disaggregation there is little chance of calculating capacity utilization coefficients for capital, let alone labor. To our knowledge, no satisfactory data exists for making such computations, particularly in the early years.

TABLE 11

SECTORAL ESTIMATES OF TECHNICAL PROGRESS

		$\lambda(1)$	$\lambda(2)$	$R^2(1)$	$R^2(2)$	$\mathcal{F}$
Total Social Sector	(000)	2.1	3.8	.995	.991	3.93
Industry & Mining	(001)	8.9	4.5	.999	.997	5.10
Agriculture & Fishing	(002)	-8.4	4.3	.979	.882	20.21
Construction	(003)	26.5	3.3	.884	.852	1.25
Transportation & Communication	(004)	7.5	5.0	.993	.984	4.86
Handicraft	(005)	9.3	2.1	.998	.981	31.00
Retail Trade & Other	(006)	-1.2	1.6	.995	.989	6.03
Electricity	(111)	7.2	5.2	.990	989	0.35
Coal & Coal Mining	(112)	5.6	4.2	.983	.982	0.33
Food, Drink & Tobacoo	(113)	12.1	0.9	.988	.942	16.49
Textiles & Clothing	(114)	1.7	1.5	.997	.995	2.18
Timber & Furniture	(115)	2.0	4.2	.998	.987	26.50
Paper, Printing & Publishing	(116)	10.6	3.8	.995	.992	2.71
Leather, Rubber & Footwear	(117)	4.9	2.8	.994	.993	0.86
Stone, Clay & Glass	(118)	10.2	4.2	.995	.971	23.59
Chemicals & Petroleum	(119)	13.5	5.8	.999	.998	6.43
Metal Using	(120)	4.6	3.9	.996	.994	1.67
Metal Making	(121)	6.8	5.9	.999	.993	27.94
Miscellaneous	(122)	12.6	2.1	.985	.833	45.61

from .970 to .882. An F test of (3.2) is made for each industry.[34] A value of $\mathcal{F}$ greater than the critical limit F.025 = 5.71 causes a rejection at a .025 significance level, of the hypothesis that (3.2) is a correct specification. For seven of the nineteen sectors with $\mathcal{F}$ values over ten, the hypothesis expressed by (3.2) is strongly rejected. For three others with values between five and six, acceptance or rejection is not clear cut. While a forceful acceptance of (3.2) is found for only one-half of the sectors, this is not a surprising or destructive outcome for the use of extraneous estimators. To the contrary, it is a rather strong outcome. As mentioned earlier, the unrestricted estimates contain many negative and otherwise unacceptable coefficients. When comparison is made between the extraneous estimators and any set of "reasonable" output elasticities, the difference in the squared error is small.[35] For this reason, we argue that acceptance of (3.2) for one-half the sectors is a strong showing.

The ultimate test of the extraneous estimator hypothesis, however, must be the reasonableness of the technical progress coefficients they generate. Further evidence on this, in the form of regional estimates, is found in Table 12. For Yugoslavia and the North, all of the coefficients are positive but less than eight per cent. For the South, Serbia Proper and the South less Serbia Proper, four sectors show at least one negative coefficient and three have at least one value greater than eight percent. With ninety-five

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[34] The test statistic is $\mathcal{F} = \frac{\eta - r}{q} \; \frac{SSE(2) - SSE(1)}{SSE(1)}$ where SSE(2) and SSE(1) are the sum of the squared errors computed with and without the specification (3.2), η is the number of observations (13); r is the number of parameters estimated (4); and q is the number of extraneous restrictions imposed (2). Several critical limits are F.025 = 5.71, F.05 = 4.26 and F.10 = 3.01.

[35] This is concluded on the basis of trial regressions using the parameter configuration (.50, .50) and (.25, .75).

TABLE 12

REGIONAL ESTIMATES OF TECHNICAL PROGRESS
(in per cent)

		Yugo-slavia	North	South	Serbia Proper	South less Serbia Proper
Total Social Sector	(000)	3.8	3.7	3.3	3.7	2.7
Industry & Mining	(001)	4.5	3.9	4.9	5.0	4.6
Agriculture & Fishing	(002)	4.3	7.1	-1.4	-1.6	0.4
Construction	(003)	3.3	3.2	2.3	4.7	-0.6
Transportation & Communication	(004)	5.0	5.4	5.5	6.1	4.7
Handicrafts	(005)	2.1	0.7	2.0	2.1	1.8
Retail Trade and other	(006)	1.6	1.7	1.5	1.7	0.8
Electricity	(111)	5.2	1.8	12.4	12.6	12.5
Coal & Coal Mining	(112)	4.2	4.7	4.6	4.7	4.3
Food, Drink & Tobacco	(113)	0.9	2.3	-3.6	-3.2	-4.0
Textiles & Clothing	(114)	1.5	0.8	3.9	2.2	9.2
Timber & Furniture	(115)	4.2	2.9	0.7	2.1	4.8
Paper, Printing & Publishing	(116)	3.8	2.8	5.4	2.7	13.2
Leather, Rubber & Footwear	(117)	2.8	3.1	1.9	1.2	5.9
Stone, Clay & Glass	(118)	4.2	2.9	5.2	5.3	4.9
Chemicals & Petroleum	(119)	5.8	6.0	4.8	6.7	1.8
Metal Using	(120)	3.9	3.3	5.3	5.6	5.4
Metal Making	(121)	5.9	4.1	7.8	8.1	8.2
Miscellaneous	(122)	2.1	0.4	-2.4	-.0.5	-2.7

coefficients in all, these out liers are to be expected.

The footnote on page 52 relegates economic analysis to the companion papers which follow. Nevertheless, four observations and a generalization concerning technical progress are made. First, for the total social sector, the rate of neutral technical progress is between 2.7 and 3.7 for all of the regions of Yugoslavia. The North and Serbia Proper are both at the high end of this range and the South less Serbia Proper is at the low end. Second, for industry and mining, the pace of technical progress is quicker, but again it has a comparatively small range of 3.9 to 5.0, and this time the North is at the bottom of the range while Serbia Proper and the South less Serbia Proper are at the top. Third, for agriculture the range is much larger, 7.1 to -1.6, and this time the North is at the top while two southern regions are at the bottom. A scrutiny of the other large, one-digit sectors reveals only comparatively small regional variation. Four, for the branches of industry and mining, the southern regions do comparatively better versus the North in such non-agricultural, resource-oriented sectors as electricity (111), metal making (120) and metal using (121). The North, on the other hand, is superior in the consumer-oriented industries, food, drink and tobacco (113) and leather, rubber and footwear (117), on the high technology areas such as chemicals and petroleum (119).

The generalization is that the comparatively modest aggregate advantage of the North in dynamic efficiency is primarily due to its more market-oriented agriculture and food processing industries rather than advantages in the area of heavy industry. In contrast, the southern regions show significant superiority in the resource-oriented sectors (other than agriculture) and in the processing industries associated with those resources.

The principal goal of this paper is to obtain disaggregate estimates of production function coefficient suitable for analyzing the growth of output in Yugoslavia. This goal is met. Having gone this far, however, we take one more step and measure, for the Yugoslav social sector as a whole, the contribution of resource mobilization, economies of scale, and neutral technical progress to output growth. Table 13 gives the rates of growth for output, inputs and the value of the scale coefficient.[36]

The impressive growth rates of social sector enterprises is revealed here--value added in the social sector grows by nearly ten percent per year. This output growth, however, is matched by an equally impressive job of resource mobilization--capital and labor grow at over six percent per year. The resultant residual for technical progress approaches four percent. Roughly, we conclude that forty percent of output growth is due to technical progress and sixty percent to factor inputs. Since returns to scale are close to unity, its contribution is minimal. Similarly, since the rates of growth of capital and labor are nearly equal, the contribution of "capital deepening" is also slight.

There is a good deal of variability in these findings, but the explanation of growth in terms of "extensive development" with high rates of balanced resource mobilization and substantial technical progress is not contradicted. If we could forget the large, comparatively stagnant private sector, output growth could even be described as balanced. A discussion of sectoral growth and development policies, however, is beyond the scope of this paper.

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[36]The rate of technical progress is from a least squares regression and is a continuous rate of growth; whereas, the rates of growth of capital, labor and output are annual compound rates of growth. For this reason, the elasticity weighted rate of resource growth plus the rate of technical progress is not necessarily equal to the rate of output growth. This is to be revised.

TABLE 13

RATES OF GROWTH AND RETURNS TO SCALE: 1952 to 1964
(in per cents)

		Employment*	Capital*	Weighted*+ Inputs	Technical** Progress	Value* Added	Scale Coefficient
Total Social Sector	(000)	6.0	6.5	6.2	3.8	9.8	102
Industry & Mining	(001)	6.8	7.4	7.0	4.5	11.3	102
Agriculture & Fishing	(002)	7.2	8.0	7.1	4.3	8.7	98
Construction	(003)	4.0	9.3	5.0	3.3	7.0	93
Transportation & Communication	(004)	4.5	1.8	3.8	5.0	8.9	95
Handicraft	(005)	8.8	10.6	9.1	2.1	10.4	100
Retail Trade & Other	(006)	5.0	12.3	6.4	1.6	7.6	98
Electricity	(111)	7.0	9.4	7.8	5.2	13.7	101
Coal & Coal Mining	(112)	0.8	3.6	1.7	4.2	6.0	105
Food, Drink & Tobacco	(113)	8.0	7.8	9.1	0.9	9.4	114
Textiles & Clothing	(114)	7.8	6.8	8.1	1.5	9.6	106
Timber & Furniture	(115)	6.4	3.0	5.5	4.2	8.4	99
Paper, Printing & Publishing	(116)	9.6	12.8	9.8	3.8	13.4	97
Leather, Rubber & Footwear	(117)	7.9	7.2	8.6	2.8	11.4	110
Stone, Clay & Glass	(118)	5.8	5.7	6.3	4.2	9.8	109
Chemicals & Petroleum	(119)	9.5	10.2	10.3	5.8	15.4	106
Metal Using	(120)	9.2	7.2	10.1	3.9	14.8	112
Metal Making	(121)	3.7	5.7	4.4	5.9	9.9	115
Miscellaneous	(122)	22.7	9.0	2.1	8.5	105	

* Annual Compound rate of growth from 1952 to 1964.
+ The weights are the ordinary covariance estimates from
**Continuous compound rate of growth from least square regression.

DATA APPENDIX

Value added, employment and capital stock statistics are described in this appendix. Complete statistics for the years 1952-1966, for five regions, and 21 industries are presented at the end. For the reader who is already familiar with Yugoslav statistical sources or who is only interested in the broad outlines, a few sentences will suffice.

Value added, in constant 1966 dollars, is considered to be equivalent to the Yugoslav measure of "social product." Since official constant price series are not available for the branches of industry and mining, these missing series are estimated by the method of bi-proportional matrices. Employment is measured on an average annual basis and is taken directly from the publications of the Federal Statistical Bureau. Capital stock statistics are more complex. In addition to our standard sectoral and geographic disaggregation, we present a breakdown of fixed assets according to structures and equipment. The perpetual inventory method is used, and the base period is related to Ivo Vinsky's estimates after conversion to 1966 prices. A unique feature of the estimates is the use of durability weights for aggregating structures and equipment into total fixed assets.

The remaining pages are written for those who find this brief description insufficient.

SECTION A

VALUE ADDED

The Yugoslav concept of "social product" principally differs from "gross value added" in Western terminology because aggregate measures exclude value added originating in the service industries. Since, in this appendix, we only deal with productive (non-service) sectors of the economy, no problem is created by this discrepancy. The statistical yearbooks for 1964 through 1968 present social product in constant 1960 dinars by republics for the seven major economic sectors. For Yugoslavia as a whole, but not by republic, a further disaggregation into 22 sub-branches of industry is also available. Two transformations of this data are necessary: first, all series must be transformed from 1960 prices to 1966 prices; and second, constant price series must be estimated for our 12 branch disaggregation of industry and mining. The conversion to 1966 prices is easily performed by multiplying each sector by the percentage increase in prices between those two years. While this procedure does not allow for intra-sectoral price changes, these can be expected to be relatively unimportant in comparison with the inter-sectoral changes. In particular, by shifting to the 1966 price base we benefit from the major rationalization of prices which occurred in the 1965 reform. This reform caused significant upward revision of agricultural and raw materials prices in comparison with producer goods.

The problem of estimating a constant 1966 price, regional series of social product for each of the 12 branches of industry and mining is resolved by applying the method of bi-proportional matrices. This method is available to us because the required data are available in current prices for each year, and the marginal totals for industry and mining and for the five regions are available in both current and fixed 1966 prices. Thus, for each year we have a two-dimensional array of current price statistics (the rows being the 12 branches of industry and the columns being the five regions), whereas marginal totals in both current and fixed prices are available. What we wish to do is convert the elements of the two-dimensional table from current to 1966 price base.

In mathematically similar situations the method of bi-proportional matrices has been used in demographic analysis by Deming and Steffan[1] and in up-dating input-output matrices by Bacharach.[2] If we assume an independence of row and column effects, then the method of bi-proportional matrices has the characteristic that the derived cell estimates minimize the sum of the squared deviations of their final fixed price values from their original current price values.[3]

In practice, rather than first aggregating republics into regions and aggregating the 22 Yugoslav sub-branches of industry into our 12 sub-branches, we perform the bi-proportional estimation for the more disaggregate data and performed the aggregation afterwards. Since the amount of price inflation in industrial branches was comparatively slight between 1952 and 1966, it is felt that with one exception no serious error was introduced by this procedure. For tobacco, where the product is definitely not homogeneous by regions and where different price trends exist for the various

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[1]"On a Least Squares Adjustment of a Sampled Frequency Table When the Expected Marginal Totals are Know," Annals of Mathematical Statistics, Vol. XI (1940), pp. 427-444.

[2]"Estimating Non-negative Matrices from Marginal Data," International Economic Review, Vol. 6, No. 3 (Sept. 1965), pp. 294-310.

[3]D. Friedlander, "A Technique for Estimating a Contingency Table, Given the Marginal Totals and Some Supplementary Data," Journal of the Royal Statistical Society, CXXIV, Series A, Part 3 (1961), pp. 412-420.

products, an important error may be present. Tobacco, however, is the only one of the 22 branches for which this effect was pronounced.

SECTION B

EMPLOYMENT

Employment in the social sector by industries and republics from 1952 to 1963 is given in Statistical Bulletin 310. Similar data for subsequent years is contained in the Statistical Yearbooks. From 1952 to 1955, the data in SB310 are obtained from monthly surveys of all firms in the social sector, and after 1955 from semi-annual surveys. Exclusions include apprentices, part time employed, overseas employed, etc. Since 1961 an alternate series obtained from the complex annual reports (KGI) is available. Except for agriculture, the difference between these two series is that the KGI series is based on a 12-period average while the SB310 series is based on a 2-period average. Also, SB310 gives more complete coverage to seasonal employment in agriculture.

In general, the data on employment in the social sector appears quite reliable. Coverage with respect to the number of firms is virtually exhaustive. The principal problem would seem to be the omission of "moonlighters" (included only once as their principal occupation), temporary agricultural workers, and "dead brigades." The latter term refers to fictitious or part-time workers who appear as full-time employees on payroll lists, principally in order to reduce the enterprise's taxes.[4] The "brigades" presumably are included in the employment statistics but there are no published estimates of

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[4] Benjamin Ward, "The Firm in Illyria: Market Syndicalism", <u>American Economic Review</u>, Vol. 48, p. 584.

their magnitude. This study assumes their numbers are negligible and no adjustments are made in the employment data which are taken directly from SB310 and since 1963 from the Statistical Yearbooks.

SECTION C

TIME SERIES DATA APPENDIX

PART I. ESTIMATION OF THE CAPITAL STOCK

Introduction

All firms in the social sector of the Yugoslav economy are required to report, in detail, the nature of their capital account transactions with the bank on whom credits are drawn. This provides the bank with a complete set of investment data distinguishing investments in inventory, equipment, and structures from other transactions of the enterprises. This data is published in highly disaggregate form, by three digit branches of the economy, republics and autonomous regions, private and social sectors (the private sector investments are obtained by much cruder estimates), and by technical types of investment (total, structures, equipment, and other), and provides an unusually sound statistical base for estimating capital stock according to the perpetual inventory method. The recent publication of this data by the Institute for Economic Investments in five volumes entitled Investments 1946-1966, and totaling over one thousand pages, makes a critical contribution to the underlying data block by converting all investments into 1966 prices. These statistics serve as the basis for our capital stock estimates.

Perhaps the most serious possible flaw in these statistics is that, by accident or design, the enterprises may understate reported investments by using bank credits granted for inventory financing to purchase fixed assets. During the years preceeding the 1965 Reform, there are numerous allegations of this practice in the newspapers. Insofar as this erroneous reporting exists, it can be expected to dampen reported investments during periods of high demand accompanied by tight bank credits.

Our capital stock estimates are by no means the first for Yugoslavia. The investment data has been available for some years and has been imaginatively and painstakingly exploited by Dr. Ivo Vinski in a long series of publications analyzing the growth of Yugoslav capital stock. Vinski's work is based on the investment series described above. His estimates of the base period capital stock are derived from a detailed inventory of structures and equipment in the social sector made by the government in 1953.[1] More recently, in 1962 and 1966, the government revalued the capital stock of enterprises.[2] Among other things, this revalorization is designed to increase the value of capital assets upon which the firm must pay rent.

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[1] A partial list of the most important of Dr. Vinski's works on the Yugoslav capital stock may be helpful. The results of the 1953 census of fixed assets are presented in English in "National Wealth of Yugoslavia at the end of 1953," Income and Wealth, Series VIII (London: Bowes and Bowes, 1959), pages 160-192. These estimates for 1953 are extended to the Republics of Yugoslavia in the publication Procjena Nacionalnog Dogatstva po podrucjina Jugoslaviavije (Zagreb: Ekonomski Institut, 1959). Using the perpetual inventory method the regional estimates are then used to prepare capital stock estimates for the entire post war period in 1956 prices with the result being presented in Procjena Rasta Fiksnih Fondova po Jugoslavenskin Republikana od 1946 do 1960 (Zagreb: Ekonomski Institut, 1965). More recently, a six sector breakdown for Yugoslavia as a whole is given in 1962 prices for the years 1944 to 1964 in the article "Rat Fiksnih Fondova Jugoslavije od 1944 do 1964," Ekonomist, Broj for 1965, pp. 667-679. Estimates for the prewar period are also available in "National Product and Fixed Assets in the Territory of Jugoslavia: 1909-1959," Income and Wealth, Series IX (London: Bowes and Bowes, 1961), pp. 206-233.

[2] The 1962 revalorization of fixed assets serves as a basis for the capital stock series presented by Gojko Grdjic, "

These two sources of initial capital stock, the 1953 Survey which underlies Vinski's work, and the 1962 and 1966 revalorization, are both used by us to obtain our base year capital stock figures.

CONTRIBUTION OF THE NEW ESTIMATES

We believe that our estimates make two significant contributions to the existing capital stock figures, as well as a number of minor improvements. The two important contributions are: first, the use of durability weights when aggregating over equipment and structures; and second, the presentation of a disaggregate series of capital stock for the sub-branches of industry by regions and investment type. The need to weight equipment and structures by their respective durabilities arises because, even under idealized circumstances, the dollar cost of an investment good is not a satisfactory measure of that item's contribution to output. For example, assume there are two identical machines, A and B which produce one unit of output except that A has an average length of life of 10 years while machine B has an average length of life of one year. In a perfectly competitive economy which equalizes the discounted value of expected future receipts, the price of machine A will be ten times that of machine B. While dollar expenditure on each of the machines is a satisfactory measure of the cost of the investment goods, it is an inadequate measure of their contribution to current production. Specifically, a dollar of investment in machine B produces ten times the current output that a dollar investment in machine A does. To properly aggregate machines with different life expectancies we must first weight the capital goods by their respective durabilities.

The proper procedure for doing this and the required assumptions are detailed by Haavelmo.[7]

For practical reasons we distinguish only between two types of investments, structures and equipments. Each of these aggregates is assumed to have its own average length of life. Let K* denote the unweighted sum of the dollar value of structures, S, and equipment, E. This is the magnitude of fixed assets which the enterprise reports for accounting purposes and is the definition given in (1). In contrast, our measure of fixed assets, which utilizes the durability weights C_i^s and C_i^e, is given by the variable K in equation (2). These weights depend upon the rate of interest, P;

$$(1) \qquad K_i^* = S_i + E_i$$

$$(2) \qquad K_i = S_i\, C_i^s + E_i\, C_i^e$$

$$C_i^s = \frac{2 - e^{-p\tilde{M}}}{1 - e^{-pM_i^e}}$$

$$C_i^e = \frac{1 - e^{-p\tilde{M}}}{1 - e^{-pM_i^e}}$$

the average length of life of equipment M_i^e; the average length of life of structures M_i^s; and an arbitrary normalization coefficient $\tilde{M}$. Given

[7]Trygve Haavelmo, A Study in the Theory of Investment (Chicago: University of Chicago Press, 1960), pp. 97-102. See also the discussion of this topic in the context of investment functions by Svi Griliches, "Capital Stock in Investment Functions" in Measurement in Economics, Ed. Carl Christ and Others (Stanford: Stanford University Press, 1963), pp. 115-137.

The necessary assumptions concerning market equilibrium used by Haavelmo are: (1) that the rate of interest, P, is expected to remain constant over the life of investment goods; (2) that the annual deflated income from owning capital goods is expected to remain constant over their life; and (3) that the purchase value of capital goods is equal to their discounted future income stream. These are heady requirements, particularly for a Socialist economy, but in some ways they appear to be better satisfied for the unique blend of socialistic planning and enterprise decentralization that constitutes the Yugoslav economy than they would be for the typical capitalist economy. For example, at least in theory, the central planning of investments should eliminate many of the uncertainties that are associated with uncoordinated, independent investment decisions. These uncertainties cause investments in particular areas to have high risk premiums that raise the rate of interest which is to be used in discounting future receipt streams. Indeed, our estimation problems for the variable P are quite simple since: for the great majority of firms, an unchanging charge of 6% per annum was the lending rate of the Yugoslav government.

estimates of these four coefficients we may construct a capital stock series for the variables K whose usefulness in production function analysis is markedly superior to the variable K*. The magnitude of the differences in the coefficients C^s and C^e, and the significant differential in the rate of growth of S and E in the Yugoslav economy suggests that Haavelmo's conjecture that ..."It is my guess that such a procedure (conversion to an equalidurability basis), even if it is very rough and approximate, would be a definite improvement over the customary, but unfounded, method of measuring K simply as S + E."[8]

The second important contribution of our capital stock series is a disaggregation of industry into its sub-branches. Until this time, there has been no capital stock series available for these branches either for Yugoslavia as a whole or by regions. Our estimates, available by five regions, are presented for 12 branches of industry. These twelve branches represent an aggregation of the 22 branches available in the Yugoslav three digits classifications. The aggregation used is presented in Table 1. The regional disaggregation of capital stock into our five categories is particularly difficult to make since it requires a division of the Republic of Serbia into its components, the Uza Podruce, the Vojovdina, and the Kosmet. For time periods prior to 1952 there is very little data available for these autonomous regions. The above-mentioned publication of the IEI presents, for the first time publicly, investment data for these areas.

Among the minor improvements we would include the conversion of all of our series to 1966 prices. Vinski's regionally disaggregate data is

[8]*Ibid.*, p. 101.

only available in 1966 prices and his most recent national data is in 1962 prices. Our use of the post-1965 reform prices embodies the rationalizations of the price system which is an important goal of that reform. Another distinctive feature, if not an unmixed improvement, is the use of exponential decay in estimating retirements. Vinski's capital stock estimates deduct a retirement component apparently based upon the assumption of a "one horse shay." That is, an item of capital with an expected average length of life M produces for exactly M years and then becomes totally obsolete and is replaced. In contrast, exponential decay assumes that, in each year a fraction $\frac{1}{M}$ of the still-existing capital stock is subject to replacement. While there is scant empirical evidence for choosing between these two assumptions, retirement according to exponential decay is considerably simpler for computational purposes and is more pleasing to our *a priori* intuition.[9] Computational simplicity is achieved because retirements in any given period are a function only of the existing unretired capital stock and do not depend upon the time stream of past investments. We turn now from our discussion of what is new about our capital stock series to a more detailed discussion of the method used, and particularly of the major problems encountered.

PROBLEMS OF ESTIMATION

Estimation of capital stock according to the perpetual inventory method demands the availability of two sets of data: One for investments and the other for a base period measure of capital. In addition to these

[9] A discussion of this is available in Haavelmo, *Ibid.*, p. 127, and in Griliches, *op. cit.*, p. 119. An empirical study of the importance of this assumption is given by Helen StoneTice, "Depreciation, Obsolescence, and the Measurement of the Aggregate Capital Stock of the United States, 1900-1962." *The Review of Income and Wealth*, Series 13, No. 2, June 1967, pp. 119-154.

two requirements and their attendant problems, our use of durability weights when aggregating structures and equipment means that we must somehow obtain estimates of the average lengths of life for these two types of investment. Since the IEI investment data described above is made to order for our purpose, no further discussion of this most critical item is required. Therefore, we concentrate our discussion on the estimates of base period capital stock, and the average length of life of equipment and structures. As a preliminary to these discussions equations (3) through (7) present the formulas used in computation. Equations (3) and (4) define the stock of structures and the retirement of structures as:

$$(3) \quad S_{ijt} = S_{ijt-1} + C_i^s \; I_{ijt}^s - R_{ijt}^s \text{ , and}$$

$$(4) \quad R_{ijt}^s = \frac{S_{ijt-1}}{M_i^s}$$

Equations (5) and (6) define the stock of equipment and the retirement of equipment as:

$$(5) \quad E_{ijt} = E_{ijt-1} + C_i^e \; I_{ijt}^e - R_{ijt}^e \text{ , and}$$

$$(6) \quad R_{ijt}^e = \frac{E_{ijt-1}}{M_i^e}$$

Total capital stock is then obtained as the direct sum.

$$(7) \quad K_{ijt} = E_{ijt} + S_{ijt}$$

In the above, I_{ijt}^s and I_{ijt}^e refer to investment in structures and equipment, where i refers to industry, j to region, and t to time, and C_i^e and C_i^s are as defined in (1). A value of P of .06 and $\tilde{M}$ of 21.1 is selected. The latter is the average length of life we estimate for the total capital stock in the productive part of the social sector of the economy.

THE PROBLEM OF AVERAGE LENGTH OF LIFE

Consider first the problem of estimating the average length of life of equipment and structures, M^e and M^s. Lacking both a table describing the expected length of life of physical items of capital stock, as well as an enumeration of the various types of physical capital, we must instead use financial data on depreciation changes and the book value of fixed assets to infer these lengths of life or for each of the industry groups and for structures, equipment, and total capital. However, even using this indirect procedure, lack of data prohibits us from deriving regional estimates of each of these magnitudes. Actually, this may be an advantage since regional differences in depreciation rates may reflect differences in depreciation policy rather than differences in the durability of capital goods. (A leading Yugoslavic economist suggests that during this period the southern republics are more inclined to underestimate depreciation in order to increase distributable earnings than are the northern republics who are more confident that contributions to the depreciation fund will ultimately become available to the enterprise itself so that such contributions are both a tax offset to current income and a source of future investment fund.) In any event, our application of national coefficients to the various republics presumes that the durability of capital goods does not vary regionally, at least not within the 10 sectors for which we make estimates. Our length of life estimates are based upon the fact that Yugoslav enterprises compute depreciation according to the straight line basis.[10]

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[10] Dragomin Vojnic, Investicije na Podrucju Jugoslavije 1947-1958, (Zagreb: Ekonomski Institut, 1960), p. 198.

According to this procedure depreciation in any year where an enterprise is computed as a simple fraction 1/M of the book value of all undepreciated assets. Given data on the book value of equipment and structures, and data on the annual flow of depreciation charges which are attributable to equipment and to structures, it is a simple matter to estimate M as the ratio of the book value of capital to the depreciation flow. In practice our data is an average for the years 1963, 1964 and 1965. The choice of these periods is predicated on the fact that the revalorization of capital at the end of 1962 provides a good initial point, that the second revalorization of capital in 1966 makes the incorporation of this and later years misleading, and that an average value over three years reduces noise. The sources of our data are given in a footnote to Table 2. The cited Statistical Bulletins are unusual in that they present the accumulated depreciation fund separately for equipment and structures, thus making it possible to estimate depreciation over the three year period as the difference between the end period depreciation fund in 1965 and the initial depreciation fund in 1962. A valid objective to this procedure is that it neglects that totally depreciated assets are constantly being removed from both the book value of fixed assets account and the depreciation fund account. While it would be possible to estimate the magnitude of these removals by using our first round estimates of M and then going back and obtaining a second round set of M corrected for this phenomena, it is not felt that this would alter the estimates sufficiently to justify the additional labors. The complete set of average length of life estimates used in our durability aggregation are presented in Table 2. For the Total Productive Sector, an average length of life for both structures and equipment of 21.1 years

(15.9 years for equipment and 33.5 years for structures) appears to be a reasonable magnitude. For individual sectors, the high values for Transportation and Communication, and Handicraft appear proper, as does the low value for Construction, and Industry and Mining. The rather low, 16.4 estimate for Agriculture appears somewhat surprising to this author but it is not unreasonable. Our estimates for the sub-branches of industry present some difficulties since, in a few cases, removal of items from the depreciation fund does casse unduly small values for depreciation that result in unusually long lengths of life, in one case infinite. To correct for this we impose the restriction that M^s be no greater than 50 years, and M^e be no greater than 25 years. In the cases where these restrictions are imposed, the unconstrained values are given in parenthesis.

THE PROBLEM OF THE INITIAL CAPITAL STCCK

The most difficult problem is to obtain base year estimates of the capital stock. For the six major sectors of the economy there is no serious problem since we have Dr. Vinski's estimates for 1946 available by republics in 1956 prices. For these sectors only three adjustments are necessary: (1) use the implicit 1E1 investment price deflators to adjust to the 1966 price base; (2) separate the Uze Podruce and Vojvodina from the aggregate for Serbia in order to compute our North-South aggregates; and (3) remove estimates for the private sector from Vinski's totals which are for both the private and social sectors. The solution to the first problem is already stated, the solution to the second problem is identical to the method we used to estimate the branch data described below, and the solution to the third problem, the separation of social and private sector capital stock, uses estimates for agricultural and handicraft also developed by Vinski but which are not widely known.[11] Using Vinski's data it is possible to estimate an initial capital stock for any year since 1946. From one point of view the most satisfactory year would be 1953 since that is the date of the capital census from which Vinski obtains his estimates. Thus for 1953, his use of the one-horse-shay replacement assumption has no bearing on the estimates made for that single year. This is not true of other years. Nevertheless, this is not the base year which we choose for making our estimates. The reason for this we now explain.

The estimation of a base year capital stock value for the six major sectors may not be a problem, but the estimations of this variable for the twelve sub-branches of industry is. Consequently, our selection of a base year is designed to facilitate our estimation for the sub-branches. With respect to this problem there is no really satisfactory solution. However, there is one important factor which suggests that even substantial estimation errors for the base year 1946 may be unimportant to the value of the capital stock for the years after 1952--the years which are our principal concern. This factor is simply that, particularly in the branches of industry, investment growth is so great that by 1952 it swamps any errors which are made in the initial capital stock values for 1946. Our tactic then is to make very crude estimates for 1946 and rely on the rapid growth of investment until 1952 to make our errors unimportant. For this reason we elect to use 1946 as our base year for estimating the capital stock. The growth of investment after that date also tends to make the replacement error induced by using Vinski's estimates relatively unimportant.

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[11] Ivo Vinski, Procjera Rasta Fiksnih Fondova Jugoslavije od 1946 do [illegible] 1962.) p. 101.

Estimation of capital stock for the branches of industry in 1946 is done by projecting backwards the average capital-output ratio for the years 1963, 1964 and 1965 to 1946, and multiplying this figure by estimates of output measured in 1966 prices for that year. This is an extremely crude procedure both because the capital-output ratio is not constant over the 20 year period and because adequate regional data on real output is not available for 1946, particularly not for the autonomous provinces. A partial solution to the problem of changing capital output ratios is obtained by forcing our total for industry in 1946 to be equal to Vinski's. This is equivalent to assuming that the decrease for all branches is the same as that for industry as a whole. The absence of satisfactory output statistics for the period before 1952 causes us to use indexes of real physical product as proxies for a true index of social product. Some measure of the crudeness of these two procedures may be obtained by comparing our unconstrained original estimates with the Vinski total for Yugoslav industry in 1946 (after adjustment to 1966 prices). Our original estimates are 62 % of the Vinski estimates for 1946. The fact that our estimates are below Vinski's is consistent of the observation that over the entire 20 year period the Yugoslav capital output ratio has fallen. Therefore, it is appropriate to look upon our correction of this figure to the Vinski total as a correction for the decrease in the capital-output ratio. Although we present our initial capital stock estimates for 1946 to the critical view of scholars, in order to emphasize the crudity of the early period estimates, we do not present capital stock estimates for the period 1947-1951. After 1952 it is judged that the errors of this estimation procedure become unimportant.

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

TOTAL PRODUCTIVE SECTOR

YUGOSLAVIA

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	1386805	1472056	1627113	1803176	1792242	1931813	2059836	2216063	2426369	2652601	2709824	2771612	2960710	2990113	2934028
CAPITAL	77459	82317	87094	91931	96161	101805	108247	116489	126328	136704	147959	160432	175581	186176	197085
EQUIPMENT	34557	37072	39359	42010	44285	47525	51194	55697	60709	65986	71532	78184	86512	91922	97720
VALUE ADDED	21147	21931	24087	26682	27002	31989	35251	40847	46320	49896	52968	59992	67914	71164	76206

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	734075	770170	854318	943238	955001	1022769	1086938	1178737	1282162	1414485	1442415	1478905	1572992	1583339	1547821
CAPITAL	40187	41667	43355	45018	46718	49421	52817	57088	61723	66607	72538	78861	86010	90631	94988
EQUIPMENT	18324	19008	19770	20658	21624	23227	25318	27925	30246	32815	35848	39154	42930	45209	47510
VALUE ADDED	10947	11771	13231	14587	14866	17592	19175	22007	24907	27431	29427	33318	37039	38488	41341

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	652730	701886	772795	859938	837241	909044	972898	1037326	1144207	1238116	1267409	1292707	1387718	1406774	1386207
CAPITAL	37270	40652	43738	46912	49445	52384	55431	59400	64605	70096	75420	81571	89569	95545	102097
EQUIPMENT	16234	18065	19590	21351	22663	24300	25876	27771	30463	33171	35684	39030	43580	46713	50210
VALUE ADDED	10199	10158	10855	12094	12137	14396	16076	18839	21411	22464	23543	26673	30875	32675	34863

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	351455	376949	404924	462446	442498	481575	499698	536036	597228	647641	659996	676070	722231	729431	692755
CAPITAL	15406	16525	17612	19209	20649	22194	23780	25839	28404	30968	33384	35693	38582	41157	44393
EQUIPMENT	6683	7265	7802	8754	9535	10344	11128	12008	13236	14433	15571	16820	18412	19715	21363
VALUE ADDED	4847	4610	5062	5596	5414	6046	6742	7711	8955	9681	10092	11591	13783	14616	15608

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	301275	324937	367871	397492	394743	427469	473200	501290	546979	590475	607413	616637	665487	677343	693452
CAPITAL	21820	24084	26086	27663	28758	30154	31619	33531	36173	39100	42011	45851	50968	54366	57684
EQUIPMENT	9505	10757	11747	12558	13089	13919	14716	15735	17199	18709	20085	22186	25144	26975	28824
VALUE ADDED	5352	5550	5792	6499	6722	8350	9335	11127	12457	12783	13447	15083	17092	18061	19255

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

AGRICULTURE AND FISHING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	127660	133208	150850	175274	184642	190488	212926	245164	268783	327634	308332	311223	315639	312708	333248
CAPITAL	7153	7250	7404	7651	8175	9163	10551	12646	14286	15442	16658	17986	19486	20279	21111
EQUIPMENT	2874	2921	3062	3292	3697	4534	5712	7352	8414	9185	9980	10807	11768	12292	12743
VALUE ADDED	2146	1849	1803	1839	1517	2420	2713	4332	4525	4654	5407	5817	6324	6362	7660

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	80697	84065	96417	110474	117851	119447	132751	155064	172955	216679	198233	195041	195799	196357	217363
CAPITAL	4633	4600	4659	4786	5062	5655	6564	7925	8754	9411	10339	11313	12272	12736	13292
EQUIPMENT	1814	1787	1863	1989	2248	2747	3538	4645	5043	5474	6108	6715	7317	7632	7963
VALUE ADDED	937	982	1087	943	877	1398	1706	2477	2528	3203	3852	4258	4549	4364	5227

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	46963	49143	54433	64800	66791	71041	80175	90100	95828	110955	110099	116182	119840	116351	115885
CAPITAL	2520	2651	2745	2866	3113	3508	3987	4721	5531	6031	6318	6673	7213	7543	7819
EQUIPMENT	1060	1134	1199	1303	1449	1788	2174	2706	3372	3711	3872	4092	4451	4660	4780
VALUE ADDED	1209	867	716	895	640	1022	1007	1855	1997	1451	1555	1558	1774	1997	2432

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	24408	27744	29172	35323	37862	41650	47104	54962	58594	71439	69858	70072	72038	68961	65965
CAPITAL	1120	1165	1199	1269	1415	1582	1783	2033	2285	2432	2545	2671	2897	3023	3175
EQUIPMENT	536	561	587	648	736	874	1031	1195	1405	1498	1580	1657	1820	1917	2013
VALUE ADDED	581	212	237	324	219	282	323	530	656	704	714	739	857	1040	1277

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	22555	21399	25261	29477	28929	29391	33071	35138	37234	39516	40241	46110	47802	47390	49920
CAPITAL	1400	1486	1546	1597	1698	1926	2204	2688	3247	3598	3774	4001	4317	4520	4644
EQUIPMENT	524	573	612	655	713	913	1142	1512	1967	2212	2292	2435	2631	2743	2767
VALUE ADDED	628	655	479	571	421	740	685	1325	1341	747	840	819	917	958	1155

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YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

INDUSTRY AND MINING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	562171	591979	670635	748094	788151	855915	928761	991351	1071960	1127675	1165048	1221960	1318742	1377584	1358000
CAPITAL	29773	33813	37314	40594	42815	44890	46918	49416	53164	57670	62416	67757	73949	78314	83273
EQUIPMENT	16074	18544	20587	22574	23980	25267	26688	28430	31062	34108	37254	41213	45786	48857	52295
VALUE ADDED	7587	8311	9505	10847	11918	13983	15649	17481	19867	21223	22783	26336	30575	33118	35236

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	319598	334244	377799	415095	434951	468334	503199	534746	574074	599404	615211	644629	690750	715321	698200
CAPITAL	14515	15766	16854	17754	18420	19290	20190	21340	23107	25167	27372	29763	32251	33603	34986
EQUIPMENT	8113	8824	9427	9936	10358	10922	11581	12390	13656	15052	16571	18249	20022	20990	21932
VALUE ADDED	4563	5057	5678	6409	6809	7894	8484	9562	10864	11702	12512	14315	16262	17483	18797

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	242573	257735	292836	332999	353200	387581	425562	456605	497886	528271	549837	577331	627992	662263	659800
CAPITAL	15257	18047	20460	22839	24396	25600	26728	28076	30057	32503	35044	37994	41698	44710	48287
EQUIPMENT	7961	9720	11160	12638	13622	14346	15107	16040	17406	19057	20683	22964	25763	27867	30363
VALUE ADDED	3024	3254	3828	4438	5109	6088	7165	7918	9002	9520	10271	12021	14313	15635	16439

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	122364	129598	146607	169098	180340	197613	214736	227398	247436	258618	269945	287949	310118	331688	332400
CAPITAL	6230	7124	7906	9090	9853	10395	11021	11738	12627	13609	14469	15420	16660	17966	19587
EQUIPMENT	3127	3635	4104	4921	5452	5758	6186	6698	7358	8072	8709	9419	10290	11121	12203
VALUE ADDED	1454	1515	1815	2107	2408	2698	3120	3482	3953	4314	4664	5540	6589	7356	7743

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	120209	128137	146229	163901	172860	189968	210826	229207	250450	269653	279892	289382	317874	330575	327400
CAPITAL	8982	10880	12513	13710	14506	15170	15674	16307	17400	18866	20548	22548	25014	26722	28679
EQUIPMENT	4789	6082	7015	7678	8132	8552	8888	9311	10019	10957	11947	13520	15449	16723	18158
VALUE ADDED	1570	1739	2012	2330	2701	3390	4045	4436	5050	5207	5606	6481	7723	8279	8696

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

CONSTRUCTION

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	217001	256151	288855	305154	228891	254843	264330	274482	316452	335357	328250	330503	358791	331337	290929
CAPITAL	1299	1528	1696	1804	1869	2152	2377	2548	2776	3085	3340	3645	4127	4267	4405
EQUIPMENT	877	1060	1173	1240	1277	1550	1758	1919	2120	2392	2578	2824	3246	3360	3467
VALUE ADDED	2427	2681	2982	2759	2009	2352	2515	2993	3596	4379	4356	5164	5836	5397	5639

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	84880	101671	117365	116689	92059	107472	110181	116396	132049	143626	146077	151806	168340	150777	127650
CAPITAL	475	582	654	696	722	883	993	1086	1196	1313	1432	1598	1801	1865	1923
EQUIPMENT	299	378	427	450	462	621	726	811	904	1002	1088	1220	1380	1430	1473
VALUE ADDED	845	1076	1253	1223	928	1110	1204	1467	1777	2095	2091	2502	2603	2466	2569

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	132121	154480	171490	188465	136832	147371	154149	158086	184403	191731	182173	178697	190451	180560	163279
CAPITAL	824	947	1041	1108	1147	1269	1384	1461	1580	1772	1907	2047	2325	2403	2482
EQUIPMENT	578	682	747	789	815	930	1032	1108	1216	1390	1490	1604	1866	1930	1993
VALUE ADDED	1582	1605	1728	1536	1081	1242	1311	1526	1820	2284	2265	2662	3234	2931	3070

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	80159	91591	95082	112926	79290	85676	81380	86475	104781	109634	105235	102219	111094	101360	73453
CAPITAL	420	472	525	558	591	667	727	765	815	901	993	1065	1169	1199	1258
EQUIPMENT	293	341	381	403	429	505	555	592	637	717	779	834	929	954	1002
VALUE ADDED	864	936	935	819	499	544	580	660	792	869	853	991	1582	1199	1262

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	51962	62889	76408	75539	57542	61695	72769	71611	79622	82097	76938	76478	79357	79200	89826
CAPITAL	404	475	516	549	556	601	657	696	765	872	914	982	1157	1203	1224
EQUIPMENT	285	341	366	387	385	425	478	516	579	673	711	771	937	976	991
VALUE ADDED	719	669	793	718	582	698	731	866	1028	1415	1412	1671	1652	1733	1808

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

TRANSPORT AND COMMUNICATION

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	139501	135575	144734	155329	152086	160261	173039	185183	195886	208161	223715	231032	246388	250826	246000
CAPITAL	30166	29988	29813	29857	30149	30671	31426	32483	33694	34845	35813	36633	38197	39029	40062
EQUIPMENT	12373	11993	11736	11639	11818	12207	12631	13166	13683	14164	14652	15072	15949	16490	17219
VALUE ADDED	2229	2432	2598	3077	3163	3630	4005	4500	5352	5582	5860	6295	6765	7205	7636
NORTH															
	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	74108	71725	76105	85567	81181	85135	93298	99614	104588	111342	121631	129344	136227	138443	133300
CAPITAL	16080	15958	15878	15891	16021	16169	16609	17064	17478	17856	18344	18865	19659	20020	20536
EQUIPMENT	6870	6700	6593	6598	6698	6816	7078	7364	7597	7828	8090	8361	8835	9151	9609
VALUE ADDED	1145	1231	1425	1641	1755	2022	2212	2395	2779	2878	3098	3406	3696	3853	3940
SOUTH															
	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	65393	63550	68629	69762	70905	75126	79741	85569	91298	96819	102084	101688	110161	112383	112700
CAPITAL	14085	14030	13935	13966	14129	14502	14816	15419	16216	16989	17469	17767	18538	19009	19527
EQUIPMENT	5503	5293	5141	5041	5121	5391	5553	5802	6086	6336	6563	6711	7114	7339	7610
VALUE ADDED	1083	1200	1173	1437	1408	1608	1793	2104	2573	2704	2762	2889	3069	3352	3695
SOUTH LESS SERBIA PROPER															
	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	28832	29033	32126	33324	33842	35465	37511	40075	44144	47249	50631	51959	55130	56690	56000
CAPITAL	5339	5314	5285	5348	5549	5888	6037	6411	6918	7379	7656	7854	8041	8108	8277
EQUIPMENT	2159	2090	2033	2014	2109	2336	2399	2564	2757	2911	3056	3183	3328	3406	3531
VALUE ADDED	415	501	469	577	603	658	721	848	1003	1085	1125	1188	1308	1373	1506
SERBIA PROPER															
	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	36561	34817	36503	36438	37063	39661	42230	45494	47154	49570	51453	49729	55031	55693	56700
CAPITAL	8747	8716	8650	8618	8579	8614	8780	9009	9299	9610	9813	9913	10498	10902	11250
EQUIPMENT	3343	3203	3108	3026	3012	3055	3155	3239	3329	3425	3506	3528	3786	3934	4079
VALUE ADDED	668	700	704	860	805	950	1072	1256	1570	1619	1637	1701	1762	1979	2190

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

HANDICRAFT

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	73796	79344	87683	109685	120591	136747	154435	171568	192729	213476	215683	209015	220330	214605	177851
CAPITAL	592	613	660	701	736	792	852	955	1096	1235	1363	1511	1693	1803	1926
EQUIPMENT	350	363	387	410	430	462	503	573	665	749	823	921	1040	1118	1207
VALUE ADDED	878	92[illegible]	1034	1285	1417	1615	1845	2054	2270	2539	2573	2767	3153	3300	3309

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	39760	45165	50500	60694	66914	74591	84763	96408	107962	119978	118825	117107	123625	120403	96108
CAPITAL	349	358	392	416	437	468	505	562	647	734	806	894	990	1049	1117
EQUIPMENT	211	214	232	245	256	275	302	345	400	454	492	548	608	651	695
VALUE ADDED	506	583	657	801	873	972	1089	1228	1366	1538	1536	1598	1813	1913	1904

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	34036	34179	37183	48991	53677	62156	69672	75160	84767	93498	96858	91908	96705	94202	81743
CAPITAL	243	255	268	285	300	324	348	393	450	501	558	618	703	754	808
EQUIPMENT	140	149	155	165	174	186	201	228	265	295	330	373	432	467	512
VALUE ADDED	372	336	376	483	544	643	756	827	903	1001	1038	1169	1340	1337	1405

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	15730	15229	17001	22245	22987	27013	30404	32810	38449	43714	44082	40415	44090	43454	36937
CAPITAL	80	87	95	106	117	126	140	169	200	227	254	290	333	364	402
EQUIPMENT	43	49	53	59	66	71	79	94	112	127	144	170	199	221	251
VALUE ADDED	158	133	159	208	220	257	306	328	392	442	436	512	561	602	591

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	18306	18950	20182	26746	30690	35143	39268	42350	46318	49784	52776	51493	52615	50748	44806
CAPITAL	163	168	173	179	183	198	208	224	250	274	304	328	371	390	407
EQUIPMENT	97	100	102	106	108	115	122	134	153	168	186	203	233	246	261
VALUE ADDED	214	204	217	276	324	386	450	499	511	559	601	658	779	785	814

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

TRADE AND OTHER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	266676	275799	284356	154719	317881	333559	326345	348315	380559	440298	468796	467879	500820	503053	528000
CAPITAL	3476	9125	10207	5475	12417	14137	16123	18441	21312	24427	28369	32900	38129	42484	46308
EQUIPMENT	2009	2191	2414	1440	3083	3505	3902	4257	4765	5388	6245	7347	8723	9805	10789
VALUE ADDED	5880	5738	6165	3570	6978	7989	8524	9487	10710	11519	11989	13613	15261	15782	16726

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1955	1966
LABOR	135032	133300	136132	309640	162045	167790	162746	176509	190534	223456	242438	240978	258251	262038	275200
CAPITAL	4135	4403	4918	11324	6056	6956	7956	9111	10541	12126	14245	16428	19037	21358	23134
EQUIPMENT	1017	1105	1226	2855	1602	1846	2093	2370	2646	3005	3499	4061	4768	5355	5838
VALUE ADDED	2951	2842	3131	6875	3624	4196	4480	4878	5593	6015	6338	7239	8116	8409	8904

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1953	1964	1965	1966
LABOR	131644	142499	148224	154921	155836	165769	163599	171806	190025	216842	226358	226901	242569	241015	252800
CAPITAL	4341	4722	5289	5848	6360	7181	8168	9330	10771	12300	14124	16472	19092	21126	23174
EQUIPMENT	992	1087	1188	1415	1482	1659	1809	1887	2118	2382	2746	3286	3954	4450	4952
VALUE ADDED	2929	2896	3034	3305	3355	3793	4044	4609	5116	5504	5652	6374	7145	7373	7822

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	79962	83754	84936	89530	88177	94158	88563	94316	103824	116987	120245	123456	129761	127278	128000
CAPITAL	2217	2363	2602	2838	3124	3536	4072	4723	5559	6420	7467	8393	9482	10497	11694
EQUIPMENT	525	589	644	709	743	800	878	865	967	1108	1303	1557	1846	2096	2363
VALUE ADDED	1375	1313	1447	1561	1465	1607	1692	1863	2159	2267	2300	2621	2886	3046	3229

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	51682	58745	63288	65391	67659	71611	75036	77490	86201	99855	106113	103445	112808	113737	124800
CAPITAL	2124	2359	2688	3010	3236	3645	4095	4607	5212	5880	6658	8079	9611	10629	11480
EQUIPMENT	467	498	544	706	739	859	931	1023	1152	1274	1443	1729	2108	2353	2588
VALUE ADDED	1553	1583	1587	1744	1889	2186	2352	2745	2957	3236	3351	3753	4259	4327	4592

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

COAL AND COAL MINING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	74962	84943	88214	92450	91931	91729	89947	86586	81490	80856	81129	83612	81100
CAPITAL	[illegible]	[illegible]	4039	4162	4339	4594	4831	5141	5373	5465	5558	5760	6018	6266	6469
EQUIPMENT	2065	2159	2186	2231	2307	2439	2603	2813	2967	3002	3059	3230	3460	3667	3830
VALUE ADDED	748	711	852	932	1055	1114	1133	1251	1313	1372	1350	1491	1591	1609	1577

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	29702	33391	34695	35559	35560	34399	32729	31328	28002	26267	25477	26166	24760
CAPITAL	1615	1631	1629	1667	1677	1692	1713	1766	1801	1810	1793	1797	1807	1818	1839
EQUIPMENT	895	877	857	871	868	868	874	901	923	923	906	908	918	932	957
VALUE ADDED	312	335	351	392	417	446	432	452	475	511	509	505	512	492	502

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	45260	51552	53619	56891	56371	57330	57218	55258	53488	54589	55652	57446	56400
CAPITAL	[illegible]	[illegible]	2410	2494	2663	2902	3119	3375	3572	3655	3765	3964	4211	4448	4630
EQUIPMENT	1170	1282	1329	1360	1440	1571	1729	1912	2044	2079	2154	2322	2542	2735	2873
VALUE ADDED	436	[illegible]	501	540	637	668	701	798	838	860	841	986	1079	1117	1075

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	23742	26930	30606	31524	33586	34250	34333	34139	34201	33469	33510	35231	36733	36200
CAPITAL	834	902	947	1008	1112	1228	1322	1461	1538	1562	1542	1543	1580	1677	1721
EQUIPMENT	433	[illegible]	505	532	583	625	684	780	832	834	800	793	821	906	933
VALUE ADDED	306	252	335	365	433	431	469	528	562	559	570	725	765	790	751

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	18014	17439	18330	20946	22095	23305	22121	22997	23079	21057	20019	21079	20421	20713	20200
CAPITAL	1337	1427	1462	1486	1551	1674	1796	1914	2033	2093	2223	2421	2631	2771	2909
EQUIPMENT	737	802	824	828	856	946	1045	1132	1213	1245	1354	1529	1721	1829	1940
VALUE ADDED	130	125	165	175	204	236	231	270	276	301	271	261	314	328	324

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

ELECTRICITY

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	14051	14197	16123	17758	20327	23368	23762	26275	29101	30771	33512	32309	33688	36038	36000
CAPITAL	4578	5650	6611	7675	8335	8895	9398	10164	11159	12212	12954	13594	14754	15842	17057
EQUIPMENT	2002	2586	3046	3602	3984	4338	4667	5165	5801	6378	6709	7065	7698	8163	883[illegible]
VALUE ADDED	399	465	530	617	727	897	1051	1154	1156	1459	1590	1945	2103	2131	225[illegible]

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	7489	7804	8975	10329	10673	12236	12141	13549	14784	15427	16554	15806	16690	17450	17200
CAPITAL	1864	2204	2501	2837	3101	3386	3666	4037	4541	4955	5187	5425	5814	6098	6353
EQUIPMENT	901	1103	1261	1458	1597	1790	1979	2205	2534	2733	2820	2937	3123	3258	3409
VALUE ADDED	317	358	391	450	484	535	598	627	623	755	814	995	1029	1006	1092

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	6562	6393	7148	7429	9654	11132	11621	12726	14317	15344	16958	16503	16998	18588	18800
CAPITAL	2713	3446	4110	4838	5234	5509	5732	6127	6618	7256	7768	8169	8939	9743	10704
EQUIPMENT	1102	1483	1785	2144	2387	2548	2687	2960	3267	3645	3889	4128	4575	4905	5425
VALUE ADDED	83	107	140	167	243	362	453	527	533	704	776	950	1074	1125	1163

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3384	3576	3374	3992	4790	5454	6305	6898	7863	8465	8907	9289	9495	10363	10400
CAPITAL	1216	1481	1704	2004	2201	2284	2391	2575	2773	2992	3103	3226	3546	4091	4681
EQUIPMENT	531	649	765	925	1071	1121	1186	1303	1434	1569	1622	1674	1814	2041	2346
VALUE ADDED	36	57	78	104	139	208	248	306	313	372	404	519	576	597	666

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3178	2817	3774	3437	4864	5678	5316	5828	6454	6879	8051	7214	7503	8225	8400
CAPITAL	1498	1965	2407	2834	3033	3225	3341	3553	3845	4264	4664	4943	5393	5653	6023
EQUIPMENT	570	834	1020	1219	1316	1427	1501	1656	1833	2076	2267	2454	2762	2865	3079
VALUE ADDED	47	50	62	63	104	154	205	221	220	332	371	431	498	527	497

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

FOOD, DRINK, AND TOBACCO

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	61250	68455	74239	80787	90669	95160	104268	107071	110026	117811	127343	131228	121700
CAPITAL	1767	[illegible]	1976	2117	2382	2690	2984	3231	3550	3890	4138	4430	4699	4875	5057
EQUIPMENT	893	953	1022	1102	1242	1443	1627	1806	2013	2251	2426	2619	2787	2899	3026
VALUE ADDED	854	959	1090	1112	1291	1451	1619	1675	1862	1883	1920	2320	2739	2924	3252

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	36373	39256	42396	46172	50506	53926	58669	62859	64183	70222	74785	76859	71200
CAPITAL	924	985	1068	1151	1313	1483	1650	1774	2002	2262	2450	2640	2806	2889	2976
EQUIPMENT	469	514	568	616	703	816	935	1034	1187	1360	1489	1602	1700	1752	1812
VALUE ADDED	383	494	513	527	641	761	827	972	1103	1137	1194	1389	1555	1560	1846

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	24877	29199	31843	34615	40163	41234	45599	44212	45843	47589	52558	54369	50500
CAPITAL	842	874	908	965	1069	1208	1334	1457	1547	1628	1689	1790	1893	1986	2081
EQUIPMENT	424	439	454	486	539	627	692	771	826	891	938	1017	1088	1147	1214
VALUE ADDED	471	465	577	584	651	690	791	704	759	746	727	931	1184	1364	1406

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	9384	[illegible]	14070	16767	19515	20600	24107	24003	25113	21937	22236	25037	28712	30202	27700
CAPITAL	282	295	309	327	363	417	479	519	543	568	603	653	697	749	799
EQUIPMENT	152	161	171	185	208	248	282	310	334	363	388	428	459	492	527
VALUE ADDED	252	211	314	358	402	361	445	400	411	362	337	463	615	692	666

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	8760	9644	10807	12432	12328	14015	16056	17231	20486	22275	23607	22552	23846	24167	22800
CAPITAL	560	579	599	639	706	790	856	938	1004	1060	1086	1137	1196	1237	1282
EQUIPMENT	272	278	283	301	331	379	411	461	493	528	550	589	628	655	637
VALUE ADDED	219	254	263	226	249	329	346	304	348	334	390	468	568	672	740

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

TEXTILES AND CLOTHING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	87693	102440	106429	115622	128414	136513	146522	155044	170742	181799	195871	121717	44482
CAPITAL	2049	[illegible]	2207	2283	2331	2444	2562	2679	3034	3520	3992	4399	4805	2425	1733
EQUIPMENT	[illegible]	[illegible]	1354	1400	1435	1529	1627	1699	1950	2296	2636	2956	3316	1671	1219
VALUE ADDED	[illegible]	[illegible]	1510	1748	1784	2051	2204	2385	2713	2805	3159	3527	3947	2525	907

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	62045	71036	73239	78169	85123	89085	93588	96863	103887	108940	115996	207741	123300
CAPITAL	[illegible]	[illegible]	1374	1397	1407	1468	1564	1597	1711	1887	2083	2228	2371	4993	2514
EQUIPMENT	[illegible]	[illegible]	861	870	869	914	1002	1026	1108	1242	1390	1499	1623	3483	1745
VALUE ADDED	[illegible]	[illegible]	1203	1374	1368	1535	1587	1713	1926	1881	2099	2244	2488	4152	2667

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	25648	31404	33190	37453	43291	47428	52934	58181	66855	72859	79875	86024	44000
CAPITAL	706	[illegible]	833	886	924	977	998	1081	1323	1633	1908	2171	2434	2569	880
EQUIPMENT	[illegible]	[illegible]	493	531	566	615	624	672	842	1054	1246	1457	1693	1812	633
VALUE ADDED	[illegible]	[illegible]	307	374	416	516	617	672	787	924	1060	1283	1459	1627	805

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	9791	12252	12858	14573	17501	19499	21792	24840	31344	35124	37626	41542	90100
CAPITAL	[illegible]	173	195	224	249	290	309	330	391	469	567	663	776	835	2667
EQUIPMENT	95	[illegible]	110	124	147	182	193	206	245	289	358	435	539	593	1900
VALUE ADDED	28	[illegible]	77	98	125	165	216	252	296	351	444	600	649	720	1774

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	15857	19152	20332	22880	25790	27929	31142	33341	35511	37735	42249	213400	46100
CAPITAL	539	[illegible]	638	662	675	687	689	751	932	1164	1342	1508	1658	5181	1787
EQUIPMENT	330	[illegible]	383	406	419	433	431	466	597	765	887	1022	1154	3645	1267
VALUE ADDED	203	172	230	276	291	351	401	419	491	573	616	683	810	4441	969

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

TIMBER AND FURNITURE

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	3887	43630	46267	5470	85564	96503	108124	113259	123211	129174	134343	135466	130900
CAPITAL	[illegible]	[illegible]	484	1283	1287	555	2459	2528	2659	2834	2995	3174	3365	3479	3574
EQUIPMENT	1058	1050	234	540	543	276	1129	1175	1265	1375	1481	1610	1739	1829	1902
VALUE ADDED	713	747	49	443	465	60	968	1185	1333	1421	1590	1762	2036	2148	2202

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	37429	[illegible]	27588	72513	76649	49084	52123	57141	62861	64410	67979	66862	68871	68495	65800
CAPITAL	1243	1251	1074	2362	2368	1329	1334	1367	1416	1470	1525	1590	1660	1709	1754
EQUIPMENT	543	536	522	1064	1069	568	576	599	635	671	709	756	804	845	885
VALUE ADDED	423	390	380	821	825	540	521	649	692	760	891	954	1072	1140	1135

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	22242	28883	30382	32174	33441	39362	45263	48849	55232	62292	65472	66971	65100
CAPITAL	1036	[illegible]	513	1079	1081	1100	1124	1161	1243	1363	1469	1584	1705	1771	1820
EQUIPMENT	515	236	228	524	526	540	554	576	630	705	772	854	935	984	1016
VALUE ADDED	290	308	337	378	360	375	447	536	641	661	699	808	965	1008	1067

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	16441	[illegible]	44875	4670	24912	25968	26522	30615	34946	36741	38658	46374	47648	49630	49400
CAPITAL	535	1051	1274	538	489	481	472	467	472	487	508	540	569	591	612
EQUIPMENT	246	514	540	265	213	208	201	199	206	217	234	260	282	301	318
VALUE ADDED	251	357	365	50	300	304	359	429	503	515	515	591	730	773	816

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3928	72453	5346	24213	81258	6206	6919	8747	10317	12108	16574	15918	17824	17341	15700
CAPITAL	456	2348	520	502	2429	584	619	663	740	848	935	1019	1112	1157	1186
EQUIPMENT	224	1062	253	220	1108	297	319	345	394	459	510	568	628	661	676
VALUE ADDED	39	745	43	328	915	71	88	107	138	145	184	216	235	235	251

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

PAPER PRINTING AND PUBLISHING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	23110	26432	29525	32200	36421	40771	45355	50943	54157	56721	63537	67940	69400
CAPITAL	[illegible]	[illegible]	1080	1173	1229	1356	1476	1626	1868	2134	2651	3160	3592	3317	4037
EQUIPMENT	[illegible]21	[illegible]	642	700	749	838	935	1049	1243	1431	1779	2146	2479	2650	2834
VALUE ADDED	[illegible]59	[illegible]	370	494	627	704	773	886	1056	1204	1290	1424	1730	1935	2047

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	13975	15766	17396	19141	20821	22547	25023	27367	29454	30772	34299	36168	36800
CAPITAL	[illegible]34	479	552	586	593	627	649	708	811	931	1163	1423	1622	1693	1738
EQUIPMENT	[illegible]	272	318	336	346	370	392	431	504	595	748	939	1107	1169	1250
VALUE ADDED	[illegible]19	[illegible]	249	341	397	431	434	459	531	653	725	755	920	1054	1099

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	7101	[illegible]	9135	10666	12129	13059	15600	18224	20332	23576	24703	25949	29238	31772	32600
CAPITAL	[illegible]14	[illegible]	528	587	636	729	827	918	1057	1203	1488	1737	1970	2119	2249
EQUIPMENT	[illegible]83	[illegible]	324	364	403	468	544	618	739	836	1031	1208	1372	1481	1584
VALUE ADDED	[illegible]20	[illegible]	121	153	229	273	338	428	525	552	565	670	810	880	948

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	[illegible]	[illegible]	3602	4710	5704	5886	6551	7380	8190	9878	10202	10964	12599	14004	14600
CAPITAL	103	[illegible]	118	125	138	152	170	184	220	254	309	390	458	498	544
EQUIPMENT	50	[illegible]	64	70	83	97	115	125	156	178	219	266	314	341	372
VALUE ADDED	17	[illegible]	28	32	72	90	108	126	179	194	214	272	308	321	344

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	4362	[illegible]	5533	5956	6425	7173	9049	10844	12142	13698	14501	14985	16639	17768	18000
CAPITAL	211	297	411	462	499	577	657	733	837	948	1179	1347	1512	1621	1705
EQUIPMENT	133	[illegible]	260	294	320	371	429	492	583	659	812	942	1050	1140	1211
VALUE ADDED	103	[illegible]	93	120	157	183	230	302	346	358	352	397	502	559	605

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

LEATHER, RUBBER, AND FOOTWEAR

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	19903	19929	22493	24359	26745	30263	33154	36576	40358	42995	45462	48099	53701	58065	58200
CAPITAL	457	465	483	493	495	510	559	639	747	818	892	1010	1122	1209	1264
EQUIPMENT	272	274	284	291	291	303	336	392	466	518	560	638	724	797	837
VALUE ADDED	311	295	347	398	451	519	554	621	761	810	862	1039	1268	1349	1476

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	15021	14785	16320	17422	19246	21430	23080	25186	26543	28000	28234	30314	32138	34626	35300
CAPITAL	271	282	298	309	310	322	341	386	435	465	511	574	639	638	728
EQUIPMENT	165	169	178	186	186	196	209	244	280	304	327	363	415	457	488
VALUE ADDED	236	232	265	298	335	379	395	443	538	577	620	687	831	883	1022

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	4882	5144	6173	6937	7499	8833	10074	11390	13815	14995	17228	17785	21563	23439	22900
CAPITAL	185	183	185	184	185	188	218	253	312	353	381	436	483	521	536
EQUIPMENT	107	105	106	105	105	107	127	148	186	214	234	275	309	340	349
VALUE ADDED	76	62	82	101	116	140	159	178	223	233	242	352	437	466	454

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	1727	1818	1922	2109	2284	2542	2970	3402	4200	5290	6667	7134	8868	10053	9700
CAPITAL	77	77	81	82	85	87	107	130	150	165	178	201	227	250	259
EQUIPMENT	44	44	47	47	49	51	65	81	96	106	115	134	152	171	178
VALUE ADDED	11	11	15	20	23	25	30	35	51	64	57	110	148	165	165

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3155	3326	4251	4828	5215	6291	7104	7988	9615	9705	10561	10651	12695	13386	13200
CAPITAL	108	106	103	101	100	101	111	123	161	188	203	235	256	272	277
EQUIPMENT	63	62	59	57	56	56	62	67	90	108	119	141	157	169	171
VALUE ADDED	65	51	67	81	93	115	128	144	172	169	185	242	288	301	289

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

STONE, CLAY, AND GLASS

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	53130	60082	69106	76962	76700	83454	90163	93797	100550	110101	107406	104676	109661	113019	108100
CAPITAL	2134	2468	2656	2807	2896	2958	3004	3110	3374	3730	3965	4173	4399	4562	4753
EQUIPMENT	1122	1338	1449	1557	1614	1653	1683	1765	1952	2193	2359	2524	2686	2800	2929
VALUE ADDED	538	586	664	724	740	875	964	1070	1209	1280	1355	1545	1816	1915	1999

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	30778	33465	39041	42559	42754	44822	47254	48995	51279	52836	50926	49747	52553	54679	51400
CAPITAL	971	1111	1196	1266	1319	1356	1395	1477	1619	1787	1888	1991	2107	2174	2221
EQUIPMENT	542	637	685	736	772	791	817	885	990	1117	1191	1272	1356	1400	1423
VALUE ADDED	355	393	447	472	457	522	535	626	698	708	742	841	979	997	1000

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	22352	26617	30065	34403	33946	38632	42909	44802	49271	57265	56480	54929	57108	58340	56700
CAPITAL	1163	1357	1459	1541	1577	1602	1609	1633	1755	1943	2077	2182	2292	2388	2532
EQUIPMENT	581	701	764	821	843	861	866	880	963	1076	1169	1252	1330	1400	1506
VALUE ADDED	183	193	217	253	283	352	430	444	511	572	613	704	838	917	999

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	10556	13011	14274	15643	15147	17290	19492	21093	23835	27272	27249	26239	26450	26993	26400
CAPITAL	636	739	785	809	800	805	806	816	862	954	1018	1062	1100	1137	1189
EQUIPMENT	333	394	426	449	442	449	449	458	490	549	600	634	665	691	731
VALUE ADDED	87	88	87	100	104	124	156	189	214	232	255	294	336	381	399

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	11796	13605	15791	18760	18799	21342	23417	23709	25436	29993	29231	28690	30658	31347	30300
CAPITAL	527	618	674	732	777	797	803	818	893	989	1059	1121	1191	1250	1342
EQUIPMENT	248	307	338	372	401	412	417	423	472	526	568	618	665	709	775
VALUE ADDED	96	105	130	153	179	229	274	255	297	340	358	410	502	537	601

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

CHEMICALS AND PETROLEUM

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	22172	25037	27157	31022	34323	38271	43118	48665	53124	53578	55617	62113	71942	77275	81300
CAPITAL	2303	2688	3144	3686	3904	4081	4166	4415	4875	5670	6551	7426	8130	8550	9374
EQUIPMENT	1261	1511	1811	2209	2342	2463	2527	2732	3084	3677	4296	4931	5458	5809	6348
VALUE ADDED	422	467	561	673	766	926	1060	1272	1479	1655	1888	2296	2717	3273	3701

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	14272	16364	17094	19034	20485	22070	24190	27789	31122	31002	32438	36644	42536	44691	46900
CAPITAL	1661	1771	1881	1922	1926	2054	2161	2428	2815	3408	4063	4661	5123	5400	5813
EQUIPMENT	884	938	1008	1053	1067	1142	1206	1397	1691	2101	2599	3015	3336	3557	3798
VALUE ADDED	277	306	384	448	391	597	664	779	923	1044	1188	1463	1756	2184	2561

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	7900	8673	10063	11988	13838	16201	18928	20876	22002	22576	23179	25469	29406	32594	34400
CAPITAL	642	917	1264	1765	1978	2027	2005	1986	2060	2262	2488	2765	3006	3149	3561
EQUIPMENT	377	573	803	1156	1275	1321	1321	1335	1393	1576	1696	1916	2122	2252	2550
VALUE ADDED	144	162	177	225	375	329	396	493	555	612	699	833	961	1090	1140

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3546	3852	4270	5384	6187	6746	6279	7402	7831	8532	8857	10247	11840	13363	14300
CAPITAL	181	209	349	811	1015	1074	1065	1024	1004	1007	1023	1090	1210	1312	1595
EQUIPMENT	109	133	211	537	661	706	711	704	713	747	755	798	887	965	1162
VALUE ADDED	66	76	68	100	219	142	150	168	195	221	245	260	340	413	457

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	4354	4821	5793	6604	7651	9455	12649	13474	14171	14044	14322	15222	17566	19231	20100
CAPITAL	461	708	915	953	962	953	940	962	1057	1255	1465	1676	1796	1837	1965
EQUIPMENT	268	440	593	619	614	615	610	631	680	829	941	1118	1235	1286	1388
VALUE ADDED	79	86	109	125	156	187	246	325	361	391	454	573	621	677	682

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

METAL USING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	101158	111940	129334	145059	152653	167754	189018	205487	230646	250532	256775	279415	316221	332765	324200
CAPITAL	3522	3871	4174	4405	4529	4833	5123	5342	5639	6130	6853	7677	8710	9275	9836
EQUIPMENT	2143	2323	2484	2597	2680	2884	3123	3299	3507	3863	4434	5089	5911	6342	6766
VALUE ADDED	1195	1530	1774	2017	2217	2815	3304	3840	4547	4777	4916	5847	7160	7588	7832

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	54471	60369	69567	77810	81306	89043	98229	107214	120441	130560	135299	149012	166519	172573	164900
CAPITAL	1982	2121	2236	2321	2351	2455	2561	2638	2749	2922	3170	3502	3929	4140	4305
EQUIPMENT	1250	1316	1378	1400	1414	1485	1566	1627	1717	1858	2051	2307	2628	2779	2905
VALUE ADDED	719	901	1064	1186	1242	1566	1752	1978	2333	2565	2598	3116	3722	3815	3896

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	46687	51571	59767	67249	71347	78711	90789	98273	110205	119972	121476	130403	149702	160192	159300
CAPITAL	1539	1750	1938	2084	2178	2377	2562	2704	2891	3208	3683	4175	4781	5135	5531
EQUIPMENT	893	1007	1106	1197	1266	1399	1557	1672	1789	2005	2383	2782	3283	3563	3861
VALUE ADDED	476	629	710	830	975	1249	1552	1863	2215	2213	2318	2731	3438	3773	3936

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	13790	14861	16840	19003	20552	24389	27738	28433	33511	35272	36319	38013	44262	49597	50500
CAPITAL	965	1160	1282	1337	1371	1524	1668	1786	1925	2171	2529	2848	3164	3365	3611
EQUIPMENT	519	629	699	740	768	869	995	1092	1176	1349	1638	1905	2161	2318	2514
VALUE ADDED	124	160	176	189	231	307	355	426	480	594	602	730	950	1188	1212

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	32897	36710	42927	48246	50795	54322	63051	69840	76694	84700	85157	92390	105440	110595	108800
CAPITAL	575	590	656	748	807	853	894	918	965	1037	1155	1327	1617	1770	1920
EQUIPMENT	374	379	407	457	499	530	561	580	613	656	746	877	1122	1244	1347
VALUE ADDED	351	469	534	641	744	942	1197	1437	1735	1619	1716	2001	2488	2585	2725

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

METAL MAKING

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	59106	63038	66513	76404	77908	83658	86868	89077	91446	90598	89910	91762	95049	98194	99700
CAPITAL	6007	7354	8296	8884	9179	9175	9221	9253	9358	9541	10006	11011	12302	13302	14467
EQUIPMENT	3440	4383	5031	5374	5547	5464	5426	5388	5444	5578	5859	6690	7747	8579	9475
VALUE ADDED	868	934	1048	1324	1471	1715	1918	2049	2348	2407	2611	2765	2973	3237	3405

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	19922	21134	23265	27178	28024	29762	30906	30751	31632	31227	31030	31639	33119	33662	34400
CAPITAL	2155	2522	2737	2852	2868	2806	2741	2659	2606	2610	2826	3156	3527	3652	3728
EQUIPMENT	1319	1562	1710	1769	1788	1737	1687	1624	1586	1599	1755	2018	2345	2459	2519
VALUE ADDED	367	421	473	545	729	622	702	781	934	960	920	950	989	1149	1116

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	39184	41904	43248	49226	49884	53896	55962	58326	59814	59371	58880	60123	61930	64532	65300
CAPITAL	3852	4833	5560	6032	6311	6369	6480	6594	6752	6931	7180	7855	8775	9650	10739
EQUIPMENT	2121	2821	3321	3605	3759	3727	3738	3764	3858	3979	4104	4672	5402	6120	6956
VALUE ADDED	501	513	576	779	741	1093	1215	1267	1414	1447	1691	1815	1984	2087	2288

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	25944	26824	27922	32876	34613	38159	40617	41842	42904	42925	42177	42289	43664	45905	46000
CAPITAL	1191	1407	1534	1583	1612	1647	1750	1916	2133	2294	2377	2496	2612	2743	2970
EQUIPMENT	598	735	816	841	846	833	859	948	1105	1234	1323	1439	1541	1648	1830
VALUE ADDED	280	282	309	407	308	545	566	641	771	864	1023	1113	1179	1261	1409

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	13240	15080	15326	16350	15271	15737	15345	16484	16910	16446	16703	17834	18266	18627	19300
CAPITAL	2661	3425	4026	4449	4699	4722	4730	4677	4619	4637	4803	5359	6163	6907	7769
EQUIPMENT	1523	2086	2505	2764	2913	2894	2879	2816	2754	2744	2782	3233	3861	4472	5126
VALUE ADDED	221	231	266	373	433	548	649	627	643	583	668	702	804	826	879

YUGOSLAV PRODUCTION STATISTICS, 1952 TO 1966

MISCELLANEOUS

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1955	1966
LABOR	19260	19848	20431	21747	24439	26830	29679	30798	32519	36197	36740	37225	36257	36241	34000
CAPITAL	144	178	299	546	828	925	1136	1288	1528	1728	1861	1942	2053	2144	2204
EQUIPMENT	97	130	216	448	720	805	1005	1146	1369	1546	1655	1717	1780	1841	1870
VALUE ADDED	283	283	283	311	326	368	454	495	469	580	679	866	817	974	1049

NORTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	16197	16329	16567	17684	18570	20846	23266	24164	25403	27525	27225	28384	27767	28246	26300
CAPITAL	51	52	108	160	268	313	415	501	600	660	713	778	845	913	967
EQUIPMENT	35	36	62	103	207	245	339	414	501	549	587	635	667	712	742
VALUE ADDED	244	235	226	245	255	292	355	405	414	483	553	708	667	779	861

SOUTH

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	3063	3519	3864	4063	5869	5984	6413	6634	7116	8672	9515	8841	8490	7995	7700
CAPITAL	93	126	190	385	560	612	720	787	928	1069	1148	1165	1208	1232	1237
EQUIPMENT	62	95	154	345	513	560	668	732	868	997	1069	1082	1113	1128	1128
VALUE ADDED	39	48	57	66	71	75	99	90	55	97	126	158	150	194	188

SOUTH LESS SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	972	1264	1370	1543	2254	2420	2404	2498	3112	3265	3860	3729	3723	3302	3200
CAPITAL	43	47	90	279	418	405	483	530	615	687	713	709	720	718	725
EQUIPMENT	15	18	62	250	382	368	445	490	571	637	657	654	657	653	657
VALUE ADDED	8	10	15	17	22	25	39	29	20	34	51	56	41	59	55

SERBIA PROPER

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LABOR	2091	2255	2494	2520	3615	3564	4009	4136	4004	5407	5655	5112	4767	4693	4500
CAPITAL	50	79	101	106	143	208	238	257	313	382	435	456	488	513	513
EQUIPMENT	47	76	92	95	131	193	223	242	297	360	411	428	457	475	471
VALUE ADDED	32	38	42	49	49	50	60	61	35	63	75	102	108	135	133