LABOUR MARKETS AND EDUCATIONAL PLANNING IN YUGOSLAVIA

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Introduction

In this article we report on a study of relationships between labour markets and manpower planning in Yugoslavia.[1]) Manpower planning, and the situation in Yugoslavia is no exception, often ignores the existence of labour markets. It, then, is based on a rather technological approach in which projected levels of Gross Domestic Project are »translated« into educational plans. Firstly, projected levels of G.D.P. are distributed over the various economic sectors with the help of input-output analysis. Secondly, occupational structures are derived for each of these sectors on the basis of known technology parameters. And finally, projected occupational structures are related to specific characteristics of the educational system which is supposed to »produce« these occupational skills. The drawbacks of this method are well known.[2]) Most striking is an implicit rigidity, that does not meet with realities. Considerable flexibility rather than rigidity of technological parameters has been observed in many countries. Changes in relative scarcities of educational and occupational skills do have an impact on wage structures, and it would be unrealistic to assume that the workers' collectives would pay no attention to possibilities of substituting »cheaper« skills for more »expensive« ones.

We will apply cost-benefit analysis as an alternative method of manpower planning to the Yugoslav situation.[3]) In section 1 we report on »preparatory« stages of our research whereas the main results of our empirical work on manpower planning are contained in section 2.

Section 1 mainly deals with earnings' functions which yield information on »benefits« of education; data on employment specified by categories of age and skill, also needed for cost-benefit calculations,

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are directly available from Yugoslav statistical sources. Section 1 concludes with a report on estimated values for the elasticity of substitution between categories of skill.

In section 2 at first we discuss, separately, the aspects of costs and benefits of educational investments. Next profitabilities of different educational investments are calculated, mainly with the net present value method.[4]) Namely, it is assumed that in order to decide whether educational investments should be undertaken society and private individuals need information on net present values rather than on internal rates of return.

Finally, we investigate whether profitability calculations are sensitive to educational policies.

Section 1. Earnings, employment, and substitution in the Social Sector

This section begins with regression analysis of wage data. As a result one obtains the earnings' profiles that will be needed to estimate »benefits« of education. A concise statement on the employment situation follows and, finally, a report on estimated values for the elasticity of substitution between educational categories concludes this section.

1.1 Earnings in the Social Sector

The distinction between wages and profits looses its sharp edge in a system of self-management: actually, »true« labour incomes consist of the sum total of wages and profits. It, then, is assumed that workers' collectives pay a scarcity price to society for the use — usufructus — of the socially owned means of production. If such is not the case, then labour earnings include an element of capital rent. We will have to take this aspect into account when profitability calculations of educational expenses are made. (see section 2.3) Naturally, the scope of our empirical work is determined by available data. Fortunately, statistical sources provide excellent information on annual cash payments to individual workers. We, of course, would have preferred to have at our disposal data on gross labour incomes, but such do not exist.

The earnings' differences in the Social Sector have been studied extensively in three different dimensions: analyses of inter-regional, inter-industry and inter-skill differences. The coefficients of variation and ratios of extremes are usually instruments by which research of any of these three types of differences is being done.[5])

Our study of labour earnings follows a different method since one needs very specific information for analysis of educational investments: earnings' functions specified by level of education for different ages.

We will use regression analysis in a model that includes the following variables: experience, sex, capital intensity of the industry to which a worker belongs, level of education, category of job, as well

as terms of interaction between education, job-category, and experience.[6] The dependent variable as mentioned above is the total annual cash payment to the workers in the Social Sector.

The data is obtained from an annual earnings' survey undertaken by the Federal Bureau of Statistics; it provides cross-sectional information for the year 1969.[7] In Table 1 we present three different »runs« of the model, one for Yugoslavia as a whole and one each for Slovenia and Bosnia-Hercegovina, a developed and a developing republic, respectively.

The explanatory power — the adjusted correlation coefficients amount to .54 for Yugoslavia, and .61 and .59 for Slovenia and Bosnia-Hercegovina, respectively — is high for regression analysis that uses individual survey data.

The coefficients for experience occur 15 times: twice as separate variables, E and E^2, six times in interaction with educational levels, $E.S_{i\,(i=2,.,7)}$, and seven times in interaction with job categories $E.J_{k(k=2,.,8)}$. The pattern for the least educated workers doing individual manual work —S_1 and J_1 — implies a parabolic shape of earnings' functions as indicated by the positive estimate for E and the negative one for E^2 in all 3 equations: earnings rise up to a certain age, level off and,ultimately, fall even below peak levels. This effect, however, is neutralised by »learning by doing«, since interaction terms of experience, both with the level of education —$E.S_{i\,(i=2,.,7)}$—and with job categories — $E.\,J_{k\,(k=2,..,8)}$—, add to earnings especially at higher levels of education. We observe that in Yugoslavia (equation [1.1]) the interaction at university level — 26.9 — amounts to almost five times the value that is estimated for a noncomplete primary education: this implies that after 30 years experience a university graduate would earn of 26.9 times 30 and a worker with less than complete primary education 5.6 times 30. With respect to the job categories we observe that experience »pays off« for blue collar workers in machine work (J_3 with an estimate of 7.6) and for *all* white collar categories except general administrative clerks, for which the estimated coefficient is only 1.5. This pattern applies also to the equations for the regions, (1.2) and (1.3), but here the levels of statistical significance are lower. In equations (1.2) and (1.3) the statistically significant estimates for experience — E — and for experience in a quadractic form, — E^2 —, as well as for the six interaction terms of experience with levels of schooling, deviate little from the estimates observed in equation (1.1). We observe some major deviations among the statistically significant estimates of the interaction terms of experience with job categories: even after taking into account the difference in per capita income the »pay-off« in all jobs is considerably higher in Slovenia than in Bosnia-Hercegovina. We here refer, in particular, to the values 28.0 and 22.3 for experience in the categories of general management and science-research as found for Slovenia with the variables $E.\,J_7$ and $E.J_8$.

The next explanatory variable — sex (M) — with an estimate of 129 tells that, on the average, men earn 129 dinars more than women even after controlling for sector of industry, education, job categories

as well as for the role which experience plays. Regional differentiation is considerable with a high estimate of 228 for Slovenia and a low figure of 122 for Bosnia-Hercegovina. This may indicate that the statistically observable discrimination between sexes increases at higher levels of development, since average monthly income in Slovenia amounts to 1360 and to 959 in Bosnia-Hercegovina in the year in which our research was undertaken.

Table 1.

Earnings' Functions in Yugoslav Industry (1969)

Average Monthly Income: (Dinars)	(1.1) Yugoslavia 1090	(1.2) Slovenia 1360	(1.3) Bosnia-Hercegovina 959
Constant	449	614	397
E	10.6	18.1	14.3
E^2	—.3	—.5	—.3
Sex (M)	129	228	122
Industry			
I_2	80	235	84
I_3	12	—31	21
S_2	71	5*	52
$E.S_2$	5.6	4.3*	3.3
S_3	114	—15*	100
$E.S_3$	11.1	10.3	8.1
S_4	225	192	251
$E.S_4$	10.4	8.2	4.9
S_5	318	280	310
$E.S_5$	15.5	14.4	11.0
S_6	393	504	413
$E.S_6$	17.5	14.0	11.6
S_7	807	880	736
$E.S_7$	26.9	16.8	21.4
J_2	43*	229	155
$E.J_2$	2.1*	—8.8*	—2.6*
J_3	21*	44*	42*
$E.J_3$	7.6	1.9*	3.1*
J_4	126	83	169
$E.J_4$	2.8	5.4	—2.1*
J_5	58	170	52
$E.J_5$	1.5	2.7*	.7*
J_6	44	131	42
$E.J_6$	10.1	13.2	10.3

Table 1 (Continued)

Earnings' Functions in Yugoslav Industry (1969)

J_7	211	307	250
$E.J_7$	15.5	28.0	12.5
J_8	—34*	—186	318
$E.J_8$	8.4	22.3	1.9*
R^2 (adjusted)	.54	.61	.59

The estimated parameters, except those marked with an asterisk, are significant at a five percent level.

Symbols: E Years of experience, from 1 to 40
Sex (M) Earnings by Men

I_2 Industries of medium capital intensity.
I_3 Industries with high capital intensity.

S_1 At most three years elemenary education.
S_2 Elementary education of more than three and less than eight years.
S_3 Completed elementary education of eight years.
S_4 Lower technical education (at secondary level).
S_5 General secondary education.
S_6 Higher technical education (university level).
S_7 University education completed with at least a bachelor's degree.

J_1 individual manual work;	J_2 assembly line work;
J_3 machine work;	J_4 handling of transport and traffic;
J_5 general administrative;	J_6 skilled professional occupations;
J_7 general management;	J_8 science-research.

$E.S_{i\,(i=2,....,7)}$ Terms of interaction between experience and levels of education.

$E.J_{k\,(k=2,....,8)}$ Terms of interaction between experience and job categories.

To »capture« the impact of the sectors of the economy, we divided the three-digit industries into three categories: namely of light, medium and high capital intensity, $I_{1, 2, 3}$, respectively. This variable is a very important one since several economists, — we mention here in particular the work by Vanek and Jovičić —, have argued that differences in capital-intensity between industries are major explanatory variables in determining earnings differentials.[8] Our findings, however, do not support this hypothesis. For the entire Social Sector we find that in »medium« capital intensive industries work adds to monthly incomes 80 dinars, and in »high« capital intensive ones only 12 dinars. Bosnia-Hercegovina follows the national average almost exactly, whereas in Slovenia the workers in the »high« capital intensive industries earn slightly less than those in the »light« capital intensive ones while the workers in the »medium« capital intensive industries earn considerably more, namely 235 dinars. In Slovenia, the average earnings in »medium« industries exceed those in the »light« ones by about 20 percent. When one investigates the impact of industry variables in a comprehensive perspective of many explanatory variables, it is immediately clear that

these variables have only a modest role in explaining earnings differences.

Next, we have a set of twelve variables, six of which indicate levels of formal education, whereas the other six are interaction terms — discussed before — between these levels of education and experience. The estimated parameters rank, as one would expect, according to the duration and level of education. It does strike one, however, that there are very large differences: so, at the levels of primary education we have S_2 and S_3 with values of 71 and 114, and at the levels of higher technical or university education S_6 and S_7 with values of 393 and 809. Interaction of educational levels and experience brings about even larger differences: when we compare, for example, two workers with 30 years of work experience each, but with S_2 and S_7 education we see that the one with S_2 education would earn an extra of $71 + 30 \times 5.6$ dinars while the other with S_7 education would earn an additional $809 + 30 \times 26.9$ dinars.

Finally, the three models include another set of explanatory variables which indicate job categories and terms of interaction between experience and job categories. It was pointed out that experience »pays off« only in some careers and that the level of development is another variable which determines monetary success in careers. We find that for Yugoslavia as a whole the benefitting categories are J_4 of blue collar workers, and J_7 of white collar workers. Science research — J_8 — does not pay unless one has obtained experience. Again, there are differences between the regions. Concentrating only on the significant estimates, we observe that, in Slovenia, job as such pays mainly in categories J_2, J_5, J_6 and J_7, whereas experience counts in J_4, J_6, J_7 and J_8. In Bosnia-Hercegovina we observe that better levels of earnings fall in J_2, J_4, J_7 and J_8, and that experience gets awarded in J_6 and J_7.

We have reported in considerable detail on the methodology that has been applied to the analysis of earnings data. Statistical tables, measures of dispersion and of central tendencies can never be substitutes for a complete investigation of the real situation in the enterprises. We do feel, however, that regression analysis of individual earnings is a powerful instrument, since it deepens considerably the insights in earnings' structures as can be seen from the extreme values that are implied by our equations (1.2) and (1.3): according to the model, in Slovenia men with forty years experience, possessing a university degree and working in the job category of general management earn 3980 dinars whereas women with 1 year of experience doing unskilled work in the least capital intensive industry in Bosnia-Hercegovina earn 411 dinars. Regression analysis, however, only approximates the real situation: from official statistical data we know that 2.2% of all persons employed in the Social Sector earn less than 400 dinars, and it is to be expected that the upper range of the model does not »capture« the highest incomes. Still, when comparing »earnings' functions through regression analysis« with separate analyses of inter-regional, inter-skill

and inter-industry earnings' differences we conclude that a regression equation with many — 36 in the equations of Table 1 — explanatory variables is a better instrument for investigation of earnings data.[9]

1.2 The Employment Situation

For cost-benefit analysis of educational expenses one needs to take into account whether school-leavers get an opportunity to obtain »benefits« as indicated by the earnings' functions that were presented in the previous section. Profitability calculations must be adjusted for the probability of actually joining a workers' collective.

We, therefore, need information on unemployment specified by age group and level of education. A further important phenomenon is the existence of large flows of migratory workers between Yugoslavia and the West-European countries.

Fortunately, the Federal Bureau of Statistics has published extensive documentation on the employment situation in Yugoslavia and has even devoted separate survey studies to the phenomenon of migratory workers. We have also compared the Yugoslav sources on out- and inflows with the statistical information on migration published by the Federal Republic of Germany, so we were able to obtain data of sufficient accuracy for the purpose of our research in the field of education.[10]

It would go beyond the scope of this article to investigate in detail various aspects of employment creation. For instance, in the context of our research we could not investigate motivations that cause flows of migratory workers. We have therefore applied two alternative assumptions with respect to the relationship of migratory workers and unemployment in Yugoslavia. For the purposes of social cost-benefit analysis, all workers, staying abroad were counted as unemployed, while for purpose of private cost-benefit analysis, none of them was considered unemployed.

It is worth mentioning here that the cells which give relatively high percentages of unemployed, in crosstabulations by skill and age, also indicate high level of employment abroad: in 1971 with men aged 20—24 unemployment amounts to 11.6% and migration to 10.5%, with age group of 49 and over these figures are 1.6% and 1.0% respectively. As for the educational level, the unemployment and migration rates ar 9.8% and 8.7% respectively, for men with primary education and 1.4% and 2.5% respectively for those with higher education.

1.3 Substitution-Elasticity between Skill Categories

In the introductory section we mentioned elasticity of substitution between categories of skill, as a determining factor for selection of an appropriate method of manpower planning.

Elasticity in this case is the number which indicates the response of relative wage change of skill categories as a result of a one-percent change in the relative quantities of workers with the same skills.

To estimate this elasticity we explored both time-series and cross-sectional data for eight regions of Yugoslavia, and in both studies estimated the values which in absolute value exceed a numerical value of one.[11]) We, thus, have found substitution possibilities between skill categories in response to changes in income structures. It would, indeed, have been surprising to find the opposite in a system of workers' self-management: namely, to come out with values that show that workers ignore salary structures and employ skill categories in exactly the same ratios, irrespective of costs involved, as if experience and on the job training were no substitutes for education obtained through formal education. We even find that the values of substitution elasticity in Yugoslavia assume higher values than those of »capitalist« countries.[12]) Again, in our opinion, this is a result of workers' self-management: capitalist enterprises introduce hierarchical systems of organizations, which are supported by rigid wage and salary structures, whereas a collective of workers will be far more critical in accepting hierarchical organizations; the distance between workers and directors will increase and undermine the control that the workers can exert on the boards of management.

This finding has a very important implication in the field of educational planing. The fixed requirements approach, which assumes absence of substitution possibilities between skill categories, cannot be applied to Yugoslav manpower planning. One needs a method which integrates manpower planning into labour market realities. The best known alternative method, not yet applied to Yugoslav data, is the human-capital approach, and we will, in the next sections, report on a first attempt to apply this method to the Yugoslav situation.

Section 2. Educational Planning and Cost-Benefit Analysis

In this section we report on various aspects of cost-benefit analysis as applied to educational planning in Yugoslavia. Firstly, costs at various levels of formal education will be analysed. Next, there will be a brief discussion of »benefits« of educational investment with reference to earlier developed earnings' functions. And, finally, section 2.3 will deal with the results of the research.

2.1. Costs of Education

In an economic sense costs of education refer both to financial and non-financial sacrifices. Direct financial outlays are made for salaries, books and teaching aids, investments in buildings and equipment, but also for extra travel and perhaps costs of living. However, one must also take into account foregone earnings for pupils who are at an age where they could have earned an income in the labour market. It so happens that in most countries the latter costs are as large as direct financial outlays, and we will find that this also applies to Yugoslavia.

Educational statistics distinguish between seven levels of formal education: primary education, (1—3 years), primary education (up to 7 years), primary education (complete with 8 years), technical educa tion at secondary level, general secondary education, higher technical education, and, finally, university education, the symbols of which will again be S_1 up to S_7.

In the first column of Table 2 we give the numbers by which the figures of the later columns have to be multiplied in order to take into account the phenomena of dropping out and repeating years of school ing[13]). The data published by the Social Accounting Service permits suf ficiently accurate calculations of financial outlays for education. Calcula ted expenses are reported in the second column of figures in Table 2. Further calculations are needed to obtain total economic costs per pupil for each additional level of education. Firstly, we increase the direct costs with depreciation of buildings and equipment; we assume that annually 7.5 percent of the purchase price of buildings and equip ment has to be written off. These adjustments in the total outlays are given in the third column of Table 2.[14])

The fourth column in the same table gives estimates for private direct expenses on books, costs of travel and extra living expenses, in case students have to reside in hostels.

For a calculation of total direct costs — column five — one has to take into account the probability of completing an additional educational level successfully. The sixth column of the same table gives our estimates for foregone earnings, which begin at age 18; it is derived from the earnings' functions (see section 2.2). These figures have also been adjusted with the figures of column one. The total cost is given in column seven of Table 2. Thus, in the last column we obtain theore tically correct figures for total costs to be incurred at each additional level of education.

At this point we will have to make a distinction between total social costs and private costs. While education is officially free, it is shown in our calculations that private persons still have to bear con siderable expenses as indicated in columns 4 and 6. Private costs make for a high percentage of the total costs of investing in education at all levels. Our findings thus offer an explanation for the social stratifica tion reported by sociologists. Pupils from families in higher income brackets are at a considerable advantage as compared to the ones from poorer families, since a considerable part of the true economic costs of education at all levels has to be borne by private individuals.[15])

2.2 Benefits of Education

For a critical analysis of the »benefits« of education we refer to the literature on economics of education. We will adopt the usual approach and consider pre-tax incomes as an indication of social bene fits and post-tax income as an indication of private benefits. One needs data on earnings specified by age for each level of education and here we use a reduced earnings' function.[16])

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Table 2

Global information on costs of education in Yugoslavia (1969, per student)

Levels of Education (Duration in parentheses)	(1) Multiplying Factors	(2) Direct Annual Expenditures from Budgets (Dinars)	(3) Annual Depreciation on Buildings and Equipment (Dinars)	(4) Additional Direct Annual Private Expenditures (Dinars)	(5)* Total Direct Expenditures (Dinars)	(6) Earnings Foregone (Dinars)	(7) Total Social Expenditures on Education (Dinars)
S_1 (3)	—	—	—	—	2,100	—	2,100
S_2 (4)	(11.7)	1,125	75	—	9,200	—	9,200
S_3 (1)	—	—	—	—	2,700	—	2,700
S_4 (3)	(3.5)	1,050	150	225	5,550	15,500	21,050
S_5 (5)	(4.9)	2,000	250	235	13,375	15,500	28,875
S_6 (3)	(4.5)	4,450	500	485	22,275	47,500	69,775
S_7 (5)	(10.0)	5,500	500	720	67,200	100,500	167,700

S_1 — Primary Education (1—3 years)
S_2 — Primary Education (4—7 years)
S_3 — Primary Education (8 years)
S_4 — Lower Technical Education (at secondary level)

S_5 — General Secondary Education
S_6 — Higher Technical Education (University Level)
S_7 — University Education (Completed with at least a Bachelor's Degree)

* The total costs for Primary Education have been distributed among the three levels S_1, S_2 and S_3.

$$(2.1): \quad I = 163 + 2.92xA - .0034xA^2 + .30xAxS_2 - 101xS_3 + .89xAxS_3 + 1.09xAxS_4 - 212xS_5 + 2.28xAxS_5 - 204xS_6 + 2.62xAxS_6 - 240xS_7 + 3.90xAxS_7.$$

The estimated parameters — except (101) for variable S_3 — are significant at a five percent level.

Symbols: A = Age (18—64 years)

Si $(i = 2, \ldots, 7)$ see Table 2.

An adjustment, however, is required for the probability of earning estimated incomes. Having obtained the lifetime earnings' streams, corrected for the probability of actually earning those incomes in a gainful employment, one then subtracts »lower« income streams from »higher« ones in order to obtain the flows of net benefits resulting from a certain additional educational investment.

In our research, we have calculated the *net* benefit flows for ten different educational investments:

$$S_2 - S_1, \; S_3 - S_1, \; S_3 - S_2, \; S_4 - S_3, \; S_5 - S_3, \; S_6 - S_4, \; S_6 - S_5, \; S_7 - S_4,$$
$$S_7 - S_5, \; S_7 - S_6.$$

Calculations have been made separately for men and women and apply to the Social Sector in the entire country as well as to the most developed region, Slovenia.

It must be realized that the incomes implied by equation (2.1) refer to paid-out annual earnings, and thus need to be corrected, both for calculation of net social benefit as well as for net private benefit streams.

Taking into account that paid-out earnings contain an element of rent to the extent that the true scarcity price of capital exceeds the »kamata«, we obtain *four* different net benefit streams.

(a) Net benefit streams that are calculated from paid-out annual earnings as given by earnings' functions.

(b) To obtain an estimate of gains as perceived by private persons, one has to add a correction factor for collective consumption, since the entire surplus value belongs to the workers' collectives. Here we use a multiplying factor of 1.46. Net benefit streams indicate total private benefits as perceived by individuals that plan to undertake educational investments.

(c) A difference between the *true* scarcity price of capital and the actual »kamata« should be deducted from the »perceived« private benefits. Correct calculation of net private benefits then involves a multiplication of paid-out earnings by only 1.2.
Since their incomes include an element of capital rent individuals tend to invest larger amounts on education than warranted on grounds of efficiency calculations.

(d) Through multiplication of net benefit-streams of paid-out annual incomes — see under (a) — with a correction factor of 1.83, we obtain an indication of the net *social* benefit streams, that reflect paid-out earnings, collective consumption, as well as taxes paid by all enterprises.[17])

We would like to emphasize that our primary concern here is with methodology rather than with »exact« or »ideal« correction factors.

A further adjustment which needs to be taken into account refers to projected growth of incomes; this trend will exert an upward shift on all earnings' functions. We will apply a range of growth percentages in the next section.[18]

One final point remains to be discussed. Statistically one observes that higher levels of education are correlated with positive net income streams. It, however, would be incorrect to suggest a complete causal relationship, since ability, experience, contacts, etc. interact with education, and have to be accounted for. One usually applies a so-called »alpha-factor« which indicates a percentage of net benefits that are the results of educational investments. In most of our calculations we will assume that sixty percent of extra incomes are the result of educational investments.[19]

2.3 Net Present Values and Internal Rates of Return

As stated earlier — see section 2.2 — we will investigate ten different possibilities of investing in additional education. Simulations will be done with only four investments — $(S_3 — S_1)$, $(S_5 — S_3)$, $(S_6 — S_4)$ and $(S_7 — S_5)$ — in order to make best use of available computer facilities.

We will report both net present values and internal rates of return since ranking of net present values may not be identical with rate of return ranking. It is as important to obtain knowledge about net present values as to be assured that internal rates of return compare well with efficiency criteria.

In Table 3 we report our main findings. The first ten rows refer to ten different investment schemes and are based on paid-out income streams.

Then follow three sets of four rows — each with four investment schemes — of which the first one refers to »true« private benefits, the second to »perceived« private benefits, and the last to the figures for »social« calculations. For the calculation of Table 3 we use a »discount« rate of 5 percent which allows for several realistic combinations of growth in per capita income and discounting, like 12 and 7, 15 and 10, or only 8 and 3 percent.[20]

The first columns give net present values and internal rates of return for the male population in Yugoslavia. The last two columns give net present values and internal rates of return for the male population in Slovenia.

As for the first ten rows, we observe that, in Yugoslavia, general secondary education, lower technical education, and completed primary education are the best investments. University education is highly »inefficient«: net present values assume negative values and interal rates of return are negligible. Ranking in Slovenia is different: general

Table 3

Net present values and internal rates of return of investments
in education for men in Yugoslavia and in Slovenia

| | YUGOSLAVIA | | SLOVENIA | |
| | (1) | (2) | (3) | (4) |
	Net Present Values (dinars)	Internal Rates of Return	Net Present Values (dinars)	Internal Rates of Return
S: 2—1	— 359	4.8%	— 9,883	—0.9%
3—1	4,974	6.7	— 10,189	0.8
3—2	6,442	11.1	— 371	4.5
4—3	8,418	8.5	15,620	9.6
5—3	28,072	13.2	51,537	15.8
6—4	— 6,513	4.1	18,602	7.3
6—5	—32,132	—0.8	— 31,025	—0.9
7—4	—18,458	3.8	4,300	5.3
7—5	—47,450	1.7	— 54,825	0.9
7—6	— 4,370	4.7	— 17,304	2.8
S: 3—1	8,029	7.6	— 9,140	1.5
5—3	36,646	15.3	65,360	18.1
6—4	706	5.1	30,683	8.6
7—5	—36,849	2.6	— 43,598	1.9
S: 3—1	11,985	8.5	— 7,781	2.2
5—3	47,791	17.9	83,335	21.0
6—4	10,095	6.2	46,394	10.3
7—5	—32,062	3.6	— 29,005	3.0
S: 3—1	16,124	9.3	— 6,817	2.6
5—3	66,830	15.4	—103,337	15.9
6—4	19,205	6.6	48,592	8.4
7—5	—53,005	2.8	—166,798	—0.5

See Table 2 for symbols $S_{i \; (i=1,...., 7)}$, and text for explanation.

secondary education has priority with higher technical education fol-
lowing and technical education at the secondary level next. In Slovenia,
again, university education ranks very low. When we now turn to the
»true« private calculations — with a correction factor of benefit stre-
ams of 1.2 — we see that for the country as a whole high positive net
present values are found for general secondary and primary education
while in Slovenia this is so with secondary and higher technical
education. The figures based on »perceived« private benefits — with
multiplying factor of 1.46 — again show slight improvements in yields;
we observe that in Slovenia general secondary education and higher
technical education are quite »profitable«, their net present values

being 83,335 and 46,394 dinars, respectively. The last four rows present another case where ranking of net present values is *not* identical with ranking according to internal rates of return. With regard to net present values general secondary education takes the first place, with higher technical education, and primary education following. Social calculations — the last four rows — also indicate large inefficiencies for university education, with negative net present values of 53,005 and 166,789 for the entire country and Slovenia, respectively.

We conclude this section with simulations that are given in Table 4. These refer only to four different investment schemes: complete elementary education, general secondary education, technical higher education, and university education. We have chosen calculations that are based on paid-out earnings, since we like to present the methodology rather than suggest the precise conclusions that could be drawn.

In column (2) we repeat the figures that were given in table 3 for Yugoslavia. In column (1) we substitute an alpha-factor of .80 for the more usual one of .60 to conclude that our general conclusions with respect to efficiency of general secondary education and low yields of university investments still hold.

Table 4

Simulations with alpha-factor, »discounting«-rates, size of stipends, duration of study, and reducing »dropping-out«.

S:	Net Present Values (dinars)							
	(1) $\alpha = .80$ 5%	(2) $\alpha = .60$ 5%	(3) $\alpha = .60$ 1%	(4) $\alpha = .60$ 3%	(5) $\alpha = .60$ 7%	(6) $\alpha = .60$ 5%	(7) $\alpha = .60$ 5%	(8) $\alpha = .60$ 5%
3—1	10,055	4,974	51,805	16,298	— 605			
5—3	42,364	28,072	95,471	51,404	15,112			
6—4	5,526	— 6,513	46,471	11,691	—16,530	567	8,074	12,908
7—5	—29,778	—47,450	19,401	—24,815	—58,896	—35,544	5,407	15,158

See text for explanation.

In the remaining columns of Table 4 we again assume an alpha-factor .60.

In columns (3), (4) and (5) we report net present values under different percentages of growth and discounting namely of 1, 3 and 7.[21])

It surprises that all educational investments give solid yields only with a »discount«-rate of 1; the first place is again held by secondary education with 95,471 dinars, with elementary education and technical higher education and university education following with 51,805 and 46,471 and 19,401 dinars, respectively. The lowest discount rates only

yield »acceptable« net present values and one wonders whether individual persons do indeed base calculations on a time perspective that accounts for low scarcity prices of capital.

Finally, in column (6) we introduce more generous stipends, in column (7) the duration of studies is being reduced, and in (8) the annual number of graduates is doubled, thereby reducing the wastage of dropping-out. These figures only apply to the highest levels of education where major problems of dropping-out and repeating years have been observed. By awarding a full stipend to all students one can slightly improve basic calculations, as can be seen in column (6). Major improvements, however, are obtained by reducing the average length of studies — see column (7) — and wastage, as can be seen in the last column where the annual number of graduates has been doubled.[22])

3. Conclusions

The main conclusions can be summarized in the following statements:

1) Technical higher education and university education both for private and social purposes are rather inefficient.

2) Secondary non-technical education consistently ranks high when judged by the criterion of economic efficiency.

3) Compulsory education of eight years rather than of seven years is a valuable project when evaluated by cost-benefit analysis.

The conclusions hold well under different simulations with percentages of per-capita-growth, with discounting factors, with alternative survival rates, as well as unemployment percentages.[23])

This research represents a first attempt to apply cost-benefit analysis to manpower planning in Yugoslavia and accounts for some characteristics of the institutional setting. We mention in particular the necessity to distinguish between »true« and »perceived« benefits from educational investments, since capital incomes need to be separated from labour incomes. We have also included collective consumption in private benefits, since in the Yugoslav enterprises the entire surplus-value is at the disposal of workers, and thus one has to use a broader concept than »wages«, which lay a claim only on part of the surplus value.

The general findings compare reasonably well with other studies that have applied the fixed-requirements-approach. An O.E.C.D. study of Yugoslav manpower needs, for example, predicted for the year 1975 a surplus of 132,000 persons with university education, a deficit of 121,000 persons with secondary education and a balanced situation for technically skilled persons. In our view, however, cost-benefit analysis is a superior tool for the analysis of manpower needs since it allows for a higher degree of »fine-tuning« than is possible in the usual approach, that is based on a strict assumption with respect to elasticity of substitution between skill categories.

As for the underlying data, we have found that earnings reveal patterns that have also been observed in other countries: wages rise with age, peak-earnings occur at older age at higher levels of education. On the cost-side, we concluded that private expenses when considered as opportunity costs are still high and thus may contribute to an explanation of the phenomenon of social stratification at higher levels of education.

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5. Howard M. Wachtel presents a survey of existing studies in *Workers' Management and Workers' Wages in Yugoslavia*, Ithaca, N. Y., 1973.

6. J. Johnston gives an elaborate analysis of the use of dummy-variables in regression analysis in *Econometric Methods*, New York, 1972, chapter 6, pp. 176—196.

7. For details on the survey of earnings' statistics, see: Savezni zavod za statistiku, *Lični dohoci po kvalifikacijama*, (Anketa o neto ličnim dohocima po kvalifikacijama, 1969), Statistički bilten, No. 688, (October, 1971).

8. Jaroslav Vanek and Milena Jovičić, »The Capital Market and Income Distribution in Yugoslavia: A Theoretical and Empirical Analysis«, Working Paper No. 32, Department of Economics, Cornell University, 1972.

9. Earnings' function, furthermore, can be used for study of income distributions. For a general discussion, see: Vladimir Stoikov, »How Misleading are Income Distributions«, *The Review of Income and Wealth*, June, 1975, and for a specific investigation of the Yugoslav income distribution see: Thomas, *op. cit.*, Chapter V.

10. See for details: Thomas, *op. cit.*, Chapter II.

11. Both the theoretical aspects and the empirical results of econometric research are discussed by H. Thomas in: »Further Evidence on Substitution Assumptions in Manpower Planning«, *De Economist*, 123, Nr. 2, 1975.

12. Thomas *ibid.*, pp. 11—13.

13. See Mark Blaug, P.R.G. Layard, and Maureen Woodhall, *The Causes of Graduate Unemployment in India*, London, 1969, for background information on the use of multiplicators that account for the duration of education, repeating classes and the phenomenon of dropping-out.

14. Calculations are based on statistics published in *Statistički godišnjak*, (1971), and *Statistički Bilten* published by the Služba društvenog knjigovodstva. For details, see: Thomas, *Personal Income Distribution*, Chapter IV, p. 145.

15. Further details on costs and observations made by Yugoslav sociologists are to be found in: Thomas, *Personal Income Distribution*, Chapter IV, pp. 140—158.

16. Equation (2.1) has been estimated by using the same data that was used for the earnings' functions of section (1.1) in Table 1.

17. The multiplicators (1.83, 1.46, and 1.2) have been derived from the national accounts that are published by the Social Accounting Service.

18. The following formula: $1/(1 + d - G)^t$, takes care both of percentage of discount and growth in per-capita income, with d being the discount rate and G standing for growth rate. A specific figure, for example of five, thus represents different combinations of $(d - G)$. See Herman P. Miller and Richard A. Hornseth, *Present Value of Estimated Lifetime Earnings*, Technical Paper 16, Bureau of the Census, U.S. Dept. of Commerce, U.S. Government Printing Office, 1967.

19. For a discussion on the influence of other than educational variables on earnings differences, see Mark Blaug, *An Introduction to the Economics of Education*, Middlesex, England, 1970, Chapter 2.

20. See also footnote 18.

21. See also footnote 18.

22. Each of these phenomena would in themselves deserve a comprehensive treatment. For the purposes of our research — the application of an alternative method of manpower planning — we choose to deal with all relevant issues in a comprehensive manner rather than to analyze in depth, the phenomenon of dropping-out for instance. Chapter IV of our study, *Personal Income Distribution*, gives more elaborate details on the way in which data was collected and used for profitability calculations.

23. Our findings with different unemployment percentages, survival rates and participation rates have not been included in the simulations of section 2.3. Changes in any of these have only a very modest impact on profitability calculations.

TRŽIŠTE RADA I PLANIRANJE OBRAZOVANJA U JUGOSLAVIJI

Hendrik THOMAS

Rezime

Osnovni zaključci članka mogu se sumirati u sledećem:

1. Više tehničko kao i univerzitetsko obrazovanje i sa individualnog i sa društvenog aspekta — su neefikasni.

2. Opšte srednje obrazovanje se stalno rangira visoko, kada se ocenjuje kriterijumom ekonomske efikasnosti.

3. Obavezno osmogodišnje, više nego sedmogodišnje obrazovanje, ocenjujući cost-benefit analizom, predstavlja veoma rentabilnu investiciju.

Ovi zaključci su održivi u simulacijama s različitim procentima per capita rasta, diskontnim faktorima, alternativnim stopama nataliteta, kao i sa različitim procentima nezaposlenosti.

Ovo istraživanje predstavlja prvi pokušaj da se primeni cost-benefit analiza na planiranje obrazovanja u Jugoslaviji, uzimajući u obzir neke specifične institucionalne karakteristike. Ukazujemo naročito na neophodnost razlikovanja »stvarnih« i »observiranih« efekata obrazovnih institucija, pošto je potrebno da se dohodak kapitala odvoji od dohotka rada. Autor je takođe uključio kolektivnu potrošnju u individualne koristi, budući da u jugoslovenskom preduzeću čitav višak vrednosti stoji na raspolaganju radnicima i zbog toga se mora koristiti širi koncept nego što su »plate«, koje su samo jedan deo viška vrednosti.

Opšti rezultati mogu se dosta dobro porediti sa rezultatima drugih studija, kod kojih je bio primenjen pristup fiksnih potreba. Jedna studija OECD-a o potrebama za radnom snagom u Jugoslaviji predviđa, na primer, za 1975. godinu višak od 132.000 lica sa univerzitetskim obrazovanjem i deficit od 121.000 lica sa srednjim, kao i uravnoteženu situaciju za tehnička stručna lica. Po mišljenju autora, cost-benefit analiza je superiornije sredstvo za analizu potreba za radnom snagom, pošto ona dozvoljava viši stepen preciznosti nego što je to moguće sa uobičajenim pristupom, koji se bazira na striktnim pretpostavkama u odnosu na elastičnost substitucije među kategorijama zanimanja.

Iz priloženih podataka vidi se da zarade pokazuju iste osobine koje su već uočene u drugim zemljama: zarade rastu sa godinama, najviša zarada se ostvaruje u starijim godinama i na višim nivoima obrazovanja. U pogledu troškova, autor zaključuje da su individualni troškovi, posmatrani kao oportunitetni, još uvek visoki, što može da doprinese objašnjenju fenomena društvene stratifikacije na višim nivoima obrazovanja.