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Simulated Analysis of Income Distribution Mechanisms

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ABSTRACT *This paper analyses computer experiments with the main versions of income distribution applied in the Soviet economy for the last 3 years.*

Different versions of the income distribution mechanism are now applied in the Soviet economy. The USSR must ensure the allocation of sufficient means to the state budget and must stimulate the intensive development of enterprises on the basis of contemporary technological innovations. The main versions of the income distribution mechanism are:

- (1) the share-normative distribution of a profit (NDP);
- (2) the share-normative distribution of an income (NDI);
- (3) the income distribution by a lease contract (IDL).

A detailed description of these versions can be found in *Sbornic dokumentov* (1988) and *Polozhenie* (1989). The principal schemes of gross gain distribution can be seen in Figures 1, 2 and 3, where α_1 is the share-norm of the payment into state and local budgets, α_2 is the share-norm of the payment into the Branch Ministry Funds; β_1 , β_2 and β_3 are the share-norms of incentive funds formation.

Some original categories are explained further.

The *gross gain* is the complete gain at the expense of commodity sales. The *tax on the turnover* is the sum of the prices parts allocated to the state budget (mainly in light and food industries). The *payment for resources* may consist of three parts:

- (a) payment for capital (2–8% of its volume);
- (b) payment for the workers and employees (200–600 roubles each);
- (c) fixed payment for the land used.

The *gross income* is an element of the gross gain after subtraction of material expenditures, depreciation, tax on turnover and the social insurance fund. The *rent* is also excluded from gross income if an enterprise performs under a lease contract. Rent is a fixed amount including the payment into the Branch Ministry Fund and 10–20% of the depreciation.

The *wage fund* (WF) is the share-normative element dependent on the net commodity output. The *balance profit* is an element of gross income after subtraction

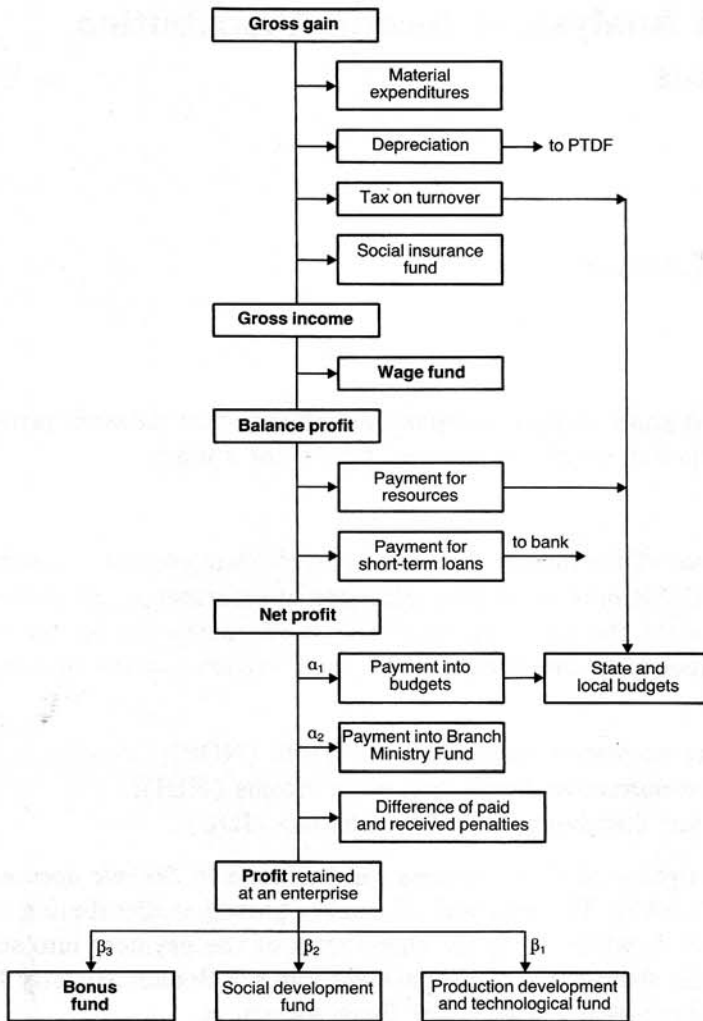


Figure 1. The scheme of share-normative profit distribution
(|→ subtraction, →| addition).

of the wage fund. The *net income (profit)* is the remainder of the gross income after subtraction of payments for resources and for short-term loans.

The *payment into budget* is divided into two parts: state budget and local budget.

The *income (profit) retained at an enterprise* is intended for the formation of incentive and reproduction funds. *United wage and bonus fund (WBF)* is the remainder of income retained at an enterprise after the formation of the *production development and technological fund (PDTF)* and the *social development fund (SDF)*. The *reproduction fund* is the sum of PDTF and SDF.

Increases in WBF are limited by normative correlations as follows:

- (a) increases in labor productivity and average WBF per worker (for NDP);
- (b) net income and WBF increases (for NDI and IDL).

Hosraschet is a method of management based on economic independence, self-planning, self-paying and self-financing.

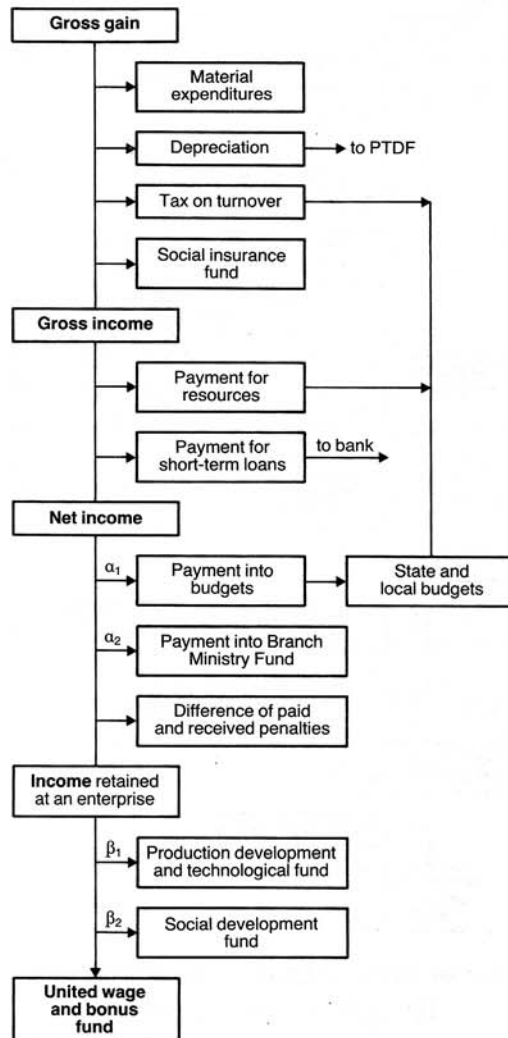


Figure 2. The scheme of share-normative income distribution
($| \rightarrow$ subtraction, $\rightarrow |$ addition).

The new economic management mechanism of a science organization is based on the same income distribution versions. The results of *science research and engineering* (SRE) are given in terms of commodities and the prices are agreed by the contract.

Computer experiments were performed with different modifications of NDP, NDI and IDL to reveal advantages and drawbacks. The experiments were based on information from one machine-building plant. A model was used which simulates the process of five-year planning in the two-level system 'management body (MB)—research institute (RI)—industrial enterprise (IE)' using different economic mechanisms. A description of this model, of planning algorithms and its computer realization can be found in Egorova & Shejhetov (1989). There a short description is presented of the heuristic algorithm of ranking evaluation for the comparison of indicator sets, obtained from model calculations for different mechanisms. The indicators are separated into groups by economic content. The equal or approximately equal values of indicators determine the equal ranks. Integral ranks of economic mechanism versions are calculated by summing up the indicators and group ranks with weight

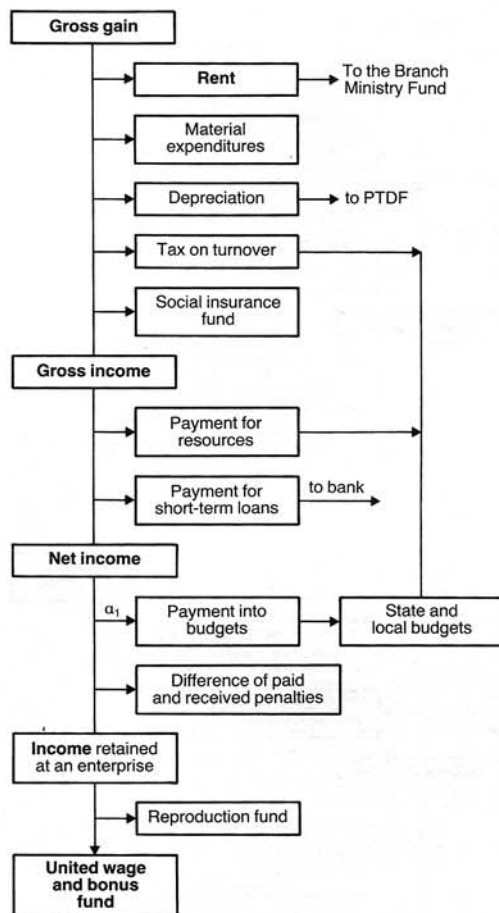


Figure 3. The scheme of share-normative income distribution by lease contract (|→subtraction, →| addition).

Table 1. Versions of income distribution mechanisms analysed

N	Type of income distribution	
	Research institute	Industrial enterprise
1	NDP	NDP
2	NDI	NDI
3	IDL	IDL
4	NDP	NDPD
5	NDI	NDPD
6	NDI	NDP
7	NDP	NDI
8	IDL	NDI
9	IDL	NDP
10	IDL	NDPD
11	NDI	IDL
12	NDP	IDL

coefficients set by the experts. The ranks change from 1 to N , where N is the number of versions compared. It may also be fractional.

The versions of income distribution analysed are represented in Table 1, where NDPD is the modification of NDP with the differentiated norms of state and local budget allocation for 'old' (α_1) and 'new' (α_1) commodities ($\alpha_1 = 3\alpha_2$).

We performed two types of computer experiments:

- (1) analysis of income distribution mechanisms 1–12 (by comparison of indicators sets);
- (2) analysis of an enterprise's interest in mastering the innovations (by a comparison of differences between economic indicators in two cases: with and without the use of innovations suggested by RI).

The analyses of preliminary computer experiments with economic mechanisms in the 10th (4.9) and 11th (3.9) five-year plans, a large-scale economic experiment in 1984–85 (4.2) and version 1 (2.7), 2 (3.2) and 3 (2.1) from Table 1 confirmed the conclusion formulated in Egorova & Shejhetov (1989) about the increasing of IE and RI indicators together with an increased completeness of *hosraschet*. The integral ranks are indicated in parentheses.

First, model calculations were performed with versions 1–12 separated into three intersecting groups according to the mechanism type of one object (RI or IE), which revealed versions with better indicators: 1, 4, 7, 8, 10, 12. It was chosen for further computer experiments.

The results of computer experiments of type 1.1 can be seen in Figure 4, which represents integral ranks of income distribution versions and ranks of innovation efficiency indicators of IE. There is no essential difference in integral ranks of

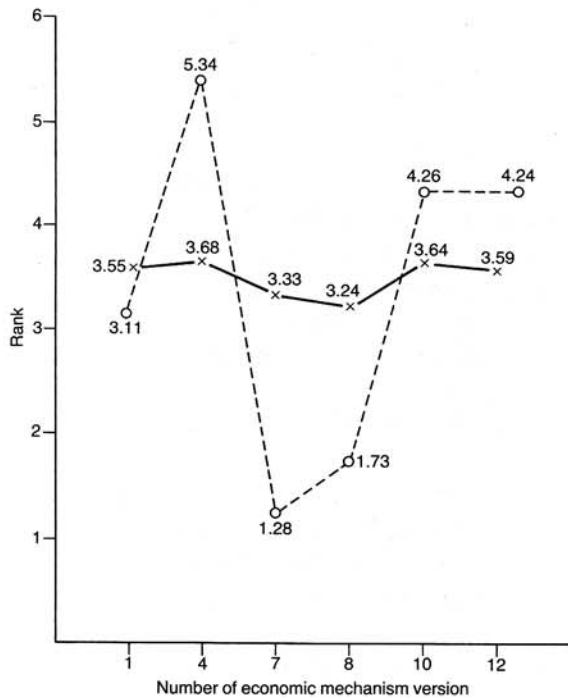


Figure 4. The integral ranks of income distribution versions (for experiments type 1). (×) The integral ranks; (○) the ranks of technical level and innovation efficiency of IE.

Table 2. The integral ranks calculation for computer experiments of type 2

N	Names of indicator or indicator group	Weight coefficient	Difference of indicator in two cases—with and without the use of innovations in 1000 roubles		
			Ver. 12	Ver. 4	Ver. 7
1	Main indicators of IE	0.2			
1.1	Gross commodity output	0.15	-207	-232	-206
1.2	Output of high quality commodities	0.15	-184	-184	-16
1.3	Gross income	0.25	941	439	938
1.4	Material expenditures	0.15	-1155	-1283	-1149
1.5	Means allocated to state budget	0.10	26	-226	26
1.6	Net commodity output	0.20	435	527	431
Ranks for group 1			1.73	2.05	2.22
2	Financial and wage funds	0.30			
2.1	PTDF	0.30	164	316	162
2.2	SDF	0.30	27	28	28
2.3	WBF	0.40	886	124	873
Ranks for group 2			1.95	2.10	1.95
3	Indicators of technical level and innovation efficiency	0.5			
3.1	Decreasing of prime cost at expense of innovations	0.25	722	722	766
3.2	Expenditures for SRE	0.15	405	514	486
3.3	Economic effect	0.35	240	236	454
3.3	Density of new commodities in gross output (%)	0.25	0.59	0.61	0.59
Ranks for group 3			2.38	2.15	1.47
Average ranks			2.12	2.11	1.77

mechanisms analysed: version 10 has best rank (3.24), version 7 having the worst (3.68). Indicators of innovation efficiency have larger variation and have best value for versions 7 and 8, when IE performs under NDI. Large-scale SRE and technological measures (radical reconstruction, mastering of principal new technology or technique, etc.) did not include plans under all mechanisms analysed in RI and IE because of essential (although temporary) decreases of gross output and profitability. An improvement of economic indicators was achieved by performing other technological measures (TM): modernization of technology, machinery and commodities. The ordered SRE prices rose by 20–100% for the planning process and became profitable for RI.

The following three income distribution versions: (a) best rank of innovation efficiency, 1.28 (7); (b) worst rank, 5.34 (4); (c) middle rank, 4.24 (12), were selected for type 2 computer experiments. RI performs under NDP for all versions analysed.

The rank evaluation results of the differences of IE indicators in two cases (with and without mastering innovations) are presented in Table 2. It shows decreasing gross commodity output by more than 200 000 roubles (line 1.1) and increasing net commodity output, gross income and values of financial funds (lines 1.3, 1.6, 2.1, 2.2 and 2.3). This is thought to be possible because of a number of changes at the expense of TM. Therefore an IE has a financial interest in mastering unprincipled innovations. But there is no essential difference in the degree of this interest when RI and IE

perform under the income distribution mechanisms analysed: difference between the best rank, 1.77 (version 7), and the worst one, 2.12 (version 12), is only $(2.12 - 1.77)/(3.0 - 1.0) \times 100 = 17\%$ of the possible maximum.

In the author's opinion, the preservation of base period proportions in calculated income distribution norms, the demerits of planning, price formation, supply and the limits on the increase of wage and bonus funds are the cause of such small differences. The effect of the replacement of normative correlation on increases in labor productivity, average wage and bonus per worker, and increases of net income and WBF by high progressive tax on WBF increases (Postanovlenie, 1989) do not fundamentally change this situation. A more strict limit is apparently in operation.

The results of computer experiments show the advantages of NDP, NDI and NDL over versions of partial *hosraschet* applied earlier, but non-essential differences of NDI, NDP and IDL in the improvement of main indicators and innovation efficiency. Therefore, it is necessary to apply other economic methods (e.g. progressive taxation with essential privileges for capital invested in new technologies and techniques) and to root out the numerous perpetuating elements of the administrative management system which has prevented the restructuring of the Soviet economy.

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