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STRUCTURAL CHANGE IN THE SOVIET ECONOMY DURING THE 1970s

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PREFACE

Many of today's most significant socioeconomic problems, such as slower economic growth, the decline of some established industries, and shifts in patterns of foreign trade, are international or transnational in nature. But these problems manifest themselves in a variety of ways; both the intensities and the perceptions of the problems differ from one country to another, so that intercountry comparative analyses of recent historical developments are necessary. Through these analyses we attempt to identify the underlying processes of economic structural change and formulate useful hypotheses concerning future developments. The understanding of these processes and future prospects provides the focus for IIASA's project on Comparative Analysis of Economic Structure and Growth.

Our research concentrates primarily on the empirical analysis of interregional and intertemporal economic structural change, on the sources of and constraints on economic growth, on problems of adaptation to sudden changes, and especially on problems arising from changing patterns of international trade, resource availability, and technology. The project relies on IIASA's accumulated expertise in related fields and, in particular, on the data bases and systems of models that have been developed in the recent past.

In this paper, Mitsuo Saito and Ryoichi Nishimiya use an interindustry model to examine structural change in the Soviet economy during the 1970s. Their supply-oriented model utilizes input–output data and national income accounts for the Soviet Union covering the period 1950–79; with the help of the econometric model, they study the causes of changes in the rates of growth in the Soviet economy during the seventies in comparison with those of the fifties and sixties. In certain of their findings, Saito and Nishimiya interpret as "technical progress" a residual term in linear homogeneous production functions: these particular results should be treated with some caution.

Anatoli Smyshlyaev
Project Leader
Comparative Analysis of

STRUCTURAL CHANGE IN THE SOVIET ECONOMY DURING THE 1970s*

Mitsuo Saito and Ryoichi Nishimiya

1. INTRODUCTION

Since the 1973 oil crisis, the market-economy countries have experienced an overall set-back in business activities, and economists have focused particular attention on analyzing the repercussions of the oil price rise on the economy as a whole. On the other hand, during the 1970s the centrally-planned countries also experienced a check on their economic growth, possibly due to causes different from those affecting the market-economy countries. The average growth of Soviet net material product fell from 7.1 percent in 1966–70 to 5.1 percent in 1971–75 and further to 3.9 percent in 1976–80. The slowdown in the growth of agriculture was more pronounced; Soviet agricultural production in 1980 was only 10 percent higher than the 1970 level due to extremely severe climatic conditions. [1]

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[1] According to the estimates of R.V. Greenlade (*USSR: Measures of Economic Growth and Development, 1950–80*, Joint Economic Committee of the United States, December 1982), the average growth rate of Soviet gross national product as it is usually defined in western countries fell from 5.1 percent in 1961–70 to 3.7 percent in 1971–75 and further to 2.7 percent in 1976–80.

The main purpose of this paper is to identify the causes of the decline in the rates of growth in the Soviet economy during the 1970s, and particularly during the latter half of the period. The method employed is to examine the occurrence of structural change in the equations of an interindustry model of the Soviet economy, which was previously estimated by one of the authors on the basis of annual time-series data for 1950–70.[2]

Section 2 explains the main features of the Soviet model. Sections 3, 4, and 5 deal with the reestimation of the model for the extended sample period 1950–79 and discuss the results. By and large, the estimates of the coefficients of the structural equations turned out to be fairly stable, except for a distinct change in the estimates for the 1970s in the rate of technical progress within the production functions. This suggests that the main cause of the lower rates of growth recently observed may have been an overall slowdown in technical progress within Soviet industry.

2. OUTLINE OF THE MODEL

The model used here is a kind of interindustry model in which important components of final demand, such as household consumption and industry investment, are treated as endogenous variables. The basic data are time series of input–output tables and national income accounts.[3] The original model in the 1978 paper was estimated from time series for the period 1950–70.

In contrast to the demand-oriented models appropriate for a market-economy country, the Soviet model is a supply-oriented model in which the production and investment functions of individual industries constitute the central part. Technical relations between *capacity* output and labor and capital inputs are represented by production functions of the Cobb–Douglas type in which technical change is allowed for by a time trend (see Section 3). The marginal productivity relationship

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[2] M. Saito, *An Interindustry Model of the Soviet Economy*, Discussion Paper No.1, Kobe University, Faculty of Economics (1978).

[3] For an explanation of the combined accounting scheme using national income accounts together with input–output systems, and the associated economic modeling, see L. R. Klein, *Lectures in Econometrics* (North-Holland Publishing Co., 1983), pp. 21–36.

was not utilized in the estimation of these functions, since its adoption is problematic for a centrally-planned economy.

The investment functions are based on the accelerator principle. Another explanatory variable is the ratio of actual to capacity output for the machinery industry, which represents a supply shortage in investment goods (see Section 4). It is true that decisions on new investment in the Soviet economy are substantially influenced by the intentions of the planning authorities in providing long-term structural adjustments rather than by short-term demands from the firms. However, even if the planners wished to make the *whole* economy function well for a longer period, it would be impossible to neglect completely the requirements for new investment in individual industries striving to maintain their achievement of output targets. As long as the planning authorities respond to such demands by allocating appropriate amounts of funds, there must exist a significant relationship between new investment and output increases in the Soviet economy.

The actual output level of each industry is a function of both its capacity output and a variable representing any supply shortages of materials it uses.

Components of final demand other than private consumption and investment are treated as exogenous variables. Total private consumption is determined not by consumption function of the Keynesian type but as the difference between total actual output and total final demand, excluding private consumption.

Finally, private consumption expenditures for individual items are explained in terms of total consumption and by a special variable treated as a "supply shortage" variable for each item (see Section 4).

The explanatory effectiveness of the model has been tested through simulations, and the results show that the general trends of Soviet economic growth during the 1950s and 1960s are traced out tolerably well.

The classifications of industries and consumption items used are as follows:

Industries

(1) Agriculture
(2) Electric power
(3) Coal products
(4) Petroleum and gas
(5) Ferrous metals
(6) Nonferrous metals
(7) Forest products
(8) Paper
(9) Construction materials
(10) Chemicals
(11) Machinery
(12) Textiles and furs
(13) Processed foods
(14) Construction
(15) Transportation and communication
(16) Trade and distribution

Consumption items

(1) Foods, other than processed foods
(2) Processed foods
(3) Clothes
(4) Consumer durables
(5) Furniture
(6) Household operation
(7) Personal services
(8) Health and education, materials
(9) Health and education, wages

3. THE PRODUCTION FUNCTIONS

We assume that the technology of each industry is represented by a Cobb–Douglas function with constant returns to scale:

$$\ln X_{i,t} = \ln A_i + \beta_i t + (1 - \alpha_i) \ln L^{*}_{i,t} + \alpha_i \ln K^{*}_{i,t}, \quad i = 1, \ldots, n \tag{3.1}$$

where

$X_{i,t}$: capacity output in industry i

$L^{*}_{i,t}$: normal labor input in industry i

$K^{*}_{i,t}$: average capital stock in industry i

t : time.

The capacity output series is obtained by tracing smoothly the peak-to-peak trend of the observed output values. Three-year moving averages of actual capital stock and employment are used as measures of capital input and labor input, respectively.

Differentiating equation (3.1) with respect to time and approximating time derivatives by first differences, we obtain a stochastic equation:

$$\Delta x_{i,t} / x_{i,t-1} = \beta_i + \alpha_i \Delta k_{i,t} / k_{i,t-1} + u_{i,t} \tag{3.2}$$

$$x_{i,t} = X_{i,t} / L^{*}_{i,t} \tag{3.3}$$

$$k_{i,t} = K^{*}_{i,t} / L^{*}_{i,t} \tag{3.4}$$

$$L^{*}_{i,t} = (L_{i,t+1} + L_{i,t} + L_{i,t-1})/3 \tag{3.5}$$

$$K^{*}_{i,t} = (K_{i,t} + K_{i,t-1} + K_{i,t-2})/3 \tag{3.6}$$

where

$L_{i,t}$: employment in industry i

$K_{i,t}$: end-of-year capital stock in industry i

$u_{i,t}$: stochastic term.

The slope and intercept of the regression equation yield estimates for α_i and β_i, respectively. The latter term is interpreted here as "technical progress," i.e. a residual term influenced by factors not quantified in a production function.

In the 1978 paper cited earlier, estimated results based on observations for 1950–70 were presented, and these are reproduced in rows denoted /o/ in **Table 1**. The main findings in that paper were as follows:

(1) There was a break in the rate of technical progress around 1960, mainly in the investment goods industries. This break was tested by using a dummy variable $D1$, which is zero before the period around 1960 and unity thereafter.

(2) By and large, the estimates for α_i and the capital share of the ith industry are reasonably comparable, indicating the significance of cost minimization or the efficient combination of capital and labor for the Soviet economy.

(3) Estimates of β_i for Soviet industries tended to exceed those for the United States for 1946–1957, but fell short of those for Japan for 1955–63.

Now we have reestimated the production functions of the same form for the extended sample period, 1950–79. The results are presented in rows denoted /e/ in **Table 1**. Comparison of the o-estimates (1950–68) and the e-estimates (1950–79) reveals the following points:

(1) The estimates for α_i are remarkably stable. Out of the eleven industries examined, the difference between the o- and e-estimates is less than 0.05 in nine industries and around 0.1 in the remaining two.

(2) There was a significant decline in the rate of technical progress around 1975 throughout industry as a whole. This was taken into account in the e-estimates by introducing a dummy variable $D3$, whose specification is given in the footnote below the table. The coefficient of the dummy variable is negative in nine industries and significant in seven industries. This decline in the rate of technical progress started somewhat earlier (in 1965) for textiles and furs and in 1971 for agriculture. The effect of $D3$ was so substantial that the rate of technical change turned out to be practically zero or even negative in most of the industries. In particular, the rate of technical progress in agriculture was found to be −2.0 percent . However, looking at the general behavior of the rate of technical change over the past thirty years, the situation after 1975 seems to have been exceptional and temporary; therefore, careful consideration will be required before using $D3$ in forecasts of the future performance of the Soviet economy.

TABLE 1. Estimates of Soviet Production Functions, 1950–79

		(1) α_i	(2) β_i	(3) $D1$ (60–)	(4) $D2$ (68–)	(5) $D3$ (75–)	(6) $\bar{R}^2$	(7) D.W.
(1) Agriculture	/o/	0.324	0.0394	−0.0325[1]			0.76	1.86
		(1.61)	(2.36)	(7.06)				
	/e/	0.308	0.0412	−0.0337[1]	−0.0064[7]	−0.0212	0.90	1.76
		(2.18)	(3.44)	(9.19)	(1.56)	(4.04)		
(2) Electric power	/o/	0.501	0.0492	−0.0471[5]			0.34	1.48
		(1.58)	(3.90)	(2.99)				
	/e/	0.406	0.0521	−0.0466[5]	0.0227	−0.0250[10]	0.46	1.82
		(2.12)	(6.18)	(4.21)	(2.72)	(1.74)		
(3) Coal products	/o/	0.627	−0.0032				0.78	1.95
		(7.64)	(0.46)					
	/e/	0.611	−0.0000			−0.0329[11]	0.86	1.76
		(8.84)	(0.01)			(5.86)		
(5) Ferrous metals	/o/	0.465	0.0329	−0.0294			0.78	1.44
		(4.18)	(3.07)	(5.68)				
	/e/	0.437	0.0354	−0.0282		−0.0165	0.86	1.76
		(5.19)	(4.34)	(7.26)		(3.60)		
(7) Forest products	/o/	0.267	0.0316	−0.0317[2]			0.69	1.57
		(2.27)	(2.93)	(5.60)				
	/e/	0.383	0.0216	−0.0343[2]	0.0263	−0.0180[11]	0.75	1.93
		(4.31)	(2.64)	(7.33)	(5.09)	(3.25)		
(9) Construction materials	/o/	0.151	0.0974	−0.0605[5]			0.71	1.58
		(1.88)	(7.96)	(6.17)				
	/e/	0.198	0.0918	−0.0635[5]		−0.0232	0.82	1.46
		(3.50)	(9.90)	(8.32)		(2.79)		
(10) Chemicals	/o/	0.411	0.0366	−0.0353			0.65	1.23
		(3.13)	(2.65)	(2.88)				
	/e/	0.412	0.0364	−0.0480	0.0414[8]	−0.0255[10]	0.78	1.84
		(5.00)	(4.16)	(5.35)	(4.88)	(2.28)		
(11) Machinery	/o/	0.439	0.0603	−0.0397			0.73	1.60
		(2.19)	(7.12)	(6.61)				
	/e/	0.410	0.0613	−0.0392	0.0092[7]		0.67	1.90
		(2.45)	(8.57)	(7.49)	(1.62)			
(12) Textiles and furs	/o/	0.494	0.0365	−0.0369[4]			0.70	1.50
		(4.54)	(4.22)	(5.08)				
	/e/	0.493	0.0365	−0.0306[4]	−0.0163[9]		0.83	2.20
		(7.51)	(6.81)	(6.15)	(4.34)			
(13) Processed foods	/o/	0.450	0.0225	−0.0248[5]			0.85	2.29
		(7.82)	(4.47)	(5.41)				
	/e/	0.442	0.0230	−0.0230[5]		−0.0127[11]	0.87	2.18
		(9.20)	(5.33)	(6.61)		(2.70)		
(14) Construction	/o/	0.242	0.0556	−0.0409[6]			0.38	2.45
		(1.40)	(3.78)	(3.13)				
	/e/	0.230	0.0562	−0.0440[6]		−0.0184[11]	0.44	2.13
		(1.71)	(4.66)	(4.13)		(1.75)		
(15) Transportation & communication	/o/	0.315	0.0795	−0.0411[5]			0.55	2.42
		(0.77)	(5.97)	(3.14)				

/o/: 1950–68, /e/: 1950–79

The years for which $D1$ = 1.0:1) after 1955, 2) after 1962, 3) after 1958, 4) after 1957, 5) after 1961, 6) after 1956.

The years for which $D2$ = 1.0:7) after 1971, 8) after 1967, 9) after 1965.

The years for which $D3$ = 1.0:10) after 1978, 11) after 1976.

(3) There was an increase in the rate of technical progress around 1968 in industries such as electric power, forest products, chemicals, and machinery. This was allowed for by the use of a dummy variable $D2$.

4. THE INVESTMENT FUNCTIONS

The investment variable in our function is net investment, and the explanatory variables are output changes in current and preceding years:

$$\max\,[Y_{i,t} - Y_{i,t-1},\, 0] \text{ and } \max\,[Y_{i,t-1} - Y_{i,t-2},\, 0]$$

where $Y_{i,t}$ is the observed output of industry i in period t. We assume that the effects of output decreases on investment are zero, since they are not symmetric with the effects of output increases. Another explanatory variable that is common to all the industries is the ratio of actual to capacity output in the machinery industry. The key industries are effectively supplied with a planned amount of new plant and equipment, irrespective of current supply conditions regarding investment goods. In a year of supply shortage, however, this will be achieved by curtailing the allocation of new plant to less important industries. Therefore, the effect of this variable on new investment in an industry will be significant and large for the less important industries, while it will be smaller in the key industries. Thus, the general form of the investment function is:

$$I_{i,t} = \delta_{i1} \max\,[Y_{i,t} - Y_{i,t-1},\, 0] + \delta_{i2} \max\,[Y_{i,t-1} - Y_{i,t-2},\, 0] + \delta_{i3} S_{11,t} + \delta_{i0} + u_{i,t} \tag{4.1}$$

$$K_{i,t} = K_{i,t-1} + I_{i,t} \tag{4.2}$$

$$S_{11,t} = Y_{11,t} / X_{11,t} \tag{4.3}$$

where

$I_{i,t}$: net investment in industry i in period t

$S_{11,t}$: the ratio of actual to capacity output in the machinery industry in period t

$u_{i,t}$: stochastic term.

Estimated results from the 1978 paper are reproduced in rows /o/ of **Table 2.**[4] The main findings were as follows:

(1) A substantial part of the movement of investment within Soviet industry could be explained by the acceleration principle represented in equation (4.1). The sum of the two coefficients of output change is regarded as a long-run value of the accelerator. A comparison between its estimated value and the capital coefficient of each industry revealed that there was a tendency for the long-run accelerator of the heavy and chemical industries to be higher than the capital coefficients, while the long-run accelerator of the consumer goods industry was lower than the corresponding capital coefficients.

(2) Investments in the heavy and chemical industries were less affected by the supply shortages of machinery than those in other industries; in particular, investment in the machinery industry was almost completely insensitive to these supply shortages, reflecting the fact that the machinery industry is accorded the highest priority in the structure of Soviet industry.

The results of the reestimation of the investment function (4.1) based on the extended sample period, 1952–79, are shown in rows /e/ of **Table 2**. It can be seen that:

(1) The e-estimates for δ_{i1} and δ_{i2} , the accelerators, are not so close to the o-estimates as was the case for the α_i values in the production functions. The e-estimates for the sum of δ_{i1} and δ_{i2}, however, are fairly comparable with, though smaller than, the corresponding o-estimates; the former is over 80 percent of the latter in six industries, and between 60 and 79 percent in six other industries; the figure is 48 percent for ferrous metals.

4

/o/: 1952–71, /e/: 1952–79

The years for which $D1$ = 1.0:1) after 1971, 2) after 1972, 3) after 1973, 4) after 1974

The years for which $D2$ = 1.0:5) after 1976, 6) after 1977, 7) after 1978,

8) 1979 is excluded, 9) 1971 is excluded,

10) the coefficient of $\Delta K_{4,t}/K_{4,t-1}\times 10^{-3}$ = –3.21 (t-value = 2.85),

11) the coefficient for the dummy (= 1.0 for 1960–70) = 0.241 (t-value = 5.62),

12) 1970 is excluded

TABLE 2. Estimates of Soviet Investment Functions, 1952–79

		(1) δ_{i1}	(2) δ_{i2}	(3) $\delta_{i3}\times10^{-3}$	(4) $\delta_{i0}\times10^{-3}$	(5) $D1$ (70–)	(6) $D2$ (78–)	(7) $\bar{R}^2$	(8) R.W.
(1) Agriculture	/o/	0.032	0.190	124.5	–116.5			0.68	1.23
		(0.28)	(1.68)	(5.47)	(5.26)				
	/e/[8]	0.100	0.092	92.4	–85.7	5.414[1]		0.90	1.60
		(1.29)	(1.18)	(4.20)	(4.01)	(6.41)			
(2) Electric power	/o/	0.607	7.559	16.38	–16.75			0.89	2.04
		(0.29)	(3.39)	(2.33)	(2.49)				
	/e/[9]	1.398	5.210	14.70	–14.86	–0.997[2]	0.651[7]	0.91	2.25
		(2.07)	(7.15)	(2.65)	(2.78)	(3.59)	(2.02)		
(3) Coal products	/o/	0.719	0.476	1.40	–0.445			0.53	1.89
		(2.27)	(1.42)	(0.69)	(0.22)				
	/e/[10]	0.366	0.352	1.13	–0.265	0.460[4]		0.76	1.56
		(1.20)	(1.06)	(0.61)	(0.14)	(6.95)			
(4) Petroleum products	/o/	0.312	2.364	5.46	–5.37			0.61	1.48
		(0.29)	(2.29)	(1.37)	(1.39)				
	/e/[11]	0.536	1.266	4.92	–4.66	0.984[1]	0.662[5]	0.89	2.23
		(0.57)	(1.35)	(1.11)	(1.09)	(4.17)	(2.62)		
(5) Ferrous metals	/o/	1.161	0.415	8.87	–8.73			0.47	1.40
		(3.12)	(1.11)	(1.97)	(2.00)				
	/e/	0.297	0.464	8.21	–7.62	0.798[3]		0.57	1.46
		(0.97)	(1.36)	(1.79)	(1.71)	(4.17)			
(7) Forest products	/o/	0.026	0.073	5.80	–5.27			0.13	0.98
		(0.17)	(0.50)	(2.39)	(2.20)				
	/e/[11]	0.019	0.050	1.47	–1.21	0.576[1]		0.90	2.33
		(0.30)	(0.77)	(1.18)	(0.99)	(10.4)			
(9) Construction materials	/o/	0.184	0.803	5.55	–5.18			0.36	1.71
		(0.34)	(1.91)	(0.84)	(0.79)				
	/e/[12]	0.085	0.806	6.17	–5.77	0.598[3]		0.65	1.73
		(0.26)	(2.58)	(1.35)	(1.27)	(3.58)			
(10) Chemicals	/o/	1.242	–0.090	8.06	–7.91			0.70	2.38
		(4.16)	(0.30)	(1.32)	(1.34)				
	/e/	0.699	0.015	10.13	–9.64		1.674[6]	0.81	1.80
		(3.33)	(0.07)	(1.71)	(1.69)		(5.25)		
(11) Machinery	/o/	0.621	0.401	1.64	–2.56			0.89	2.15
		(3.18)	(1.84)	(0.21)	(0.35)				
	/e/	0.306	0.555	5.05	–5.49			0.96	2.02
		(2.34)	(4.11)	(0.68)	(0.77)				
(12) Textiles and furs	/o/	0.080	–0.022	13.69	–12.89			0.56	1.97
		(1.38)	(0.36)	(4.02)	(3.92)				
	/e/	0.068	–0.016	10.86	–10.18	0.315[1]		0.80	2.00
		(1.70)	(0.40)	(4.06)	(3.93)	(3.16)			
(13) Processed foods	/o/	0.250	0.140	6.68	–6.68			0.73	0.97
		(4.17)	(2.23)	(1.77)	(1.82)				
	/e/	0.160	0.092	7.51	–7.16	0.699[3]		0.73	1.01
		(3.28)	(1.83)	(2.04)	(2.00)	(4.61)			
(14) Construction	/o/	0.278	0.141	21.31	–20.80			0.53	1.18
		(2.81)	(1.31)	(3.17)	(3.16)				
	/e/	0.221	0.102	21.31	–20.56	1.698[3]		0.82	1.25
		(2.65)	(1.20)	(3.35)	(3.30)	(6.43)			
(15) Transportation & communication	/o/	1.829	0.761	13.76	–13.68			0.72	1.83
		(3.61)	(1.52)	(1.60)	(1.64)				
	/e/	1.406	1.058	23.88	–23.26		5.360[6]	0.85	1.89
		(3.12)	(2.36)	(2.31)	(2.33)		(8.48)		
(16) Trade	/o/	0.499	0.008	14.53	–13.16			0.69	2.52
		(2.25)	(0.36)	(3.94)	(3.71)				

(2) The e-estimate for δ_{i3}, the coefficient of the shortage variable, is comparable both in magnitude and in t-value with the corresponding o-estimates over industry as a whole, implying long-term consistency in the priority order assigned by the planning authorities to investment allocation.

5. THE CONSUMPTION FUNCTIONS

In the 1978 paper, the following consumption functions were estimated:

$$\ln(C'_k/N)_t = \varepsilon_{k1} \ln (C'/N)_t + \varepsilon_{k2} S'_{k,t} + \varepsilon_{k0} + u_{k,t} \quad (5.1)$$

$$S'_{k,t} = \sum_{i=1}^{n} w_{ki} (Y_{i,t}/X_{i,t}) \quad (5.2)$$

where

$C'_{k,t}$: consumption of item k

C'_t : total consumption

N_t : population over 16 years of age

w_{ki} : weight of the value of output i in the value of consumption item k

$S'_{k,t}$: ratio of actual to capacity output for consumption item k.

ε_{k1} measures the elasticity of an Engel curve. $S'_{k,t}$ represents the supply conditions for a particular consumption item. If $S'_{k,t}$ is low in a given year, consumption restraint on item k will be realized by a cutback in allocation. Therefore, ε_{k2} is expected to have a positive sign.

Estimation results of equation (5.1) based on the sample period 1955–71 are reported in rows /o/ of **Table 3**. The main findings were as follows:

(1) The total consumption elasticity of nonprocessed foods is below 1.0, while the total consumption elasticities for other items are all more than 1.0. The total consumption elasticity of total food consumption is 0.766; this value is larger than estimates for market-economy countries found by earlier researchers (about 0.5–0.6).

TABLE 3. Estimates of Soviet Consumption Functions, 1955–79

		(1) ε_{k1} total consumption	(2) ε_{k2} shortage index of S'_k	(3) ε_{k0} const.	(4) $\bar{R}^2$	(5) D.W.
(1) Foods, other than processed foods	/o/	0.443	0.253[1]	−1.146	0.986	2.08
		(31.8)	(5.71)	(27.9)		
	/e/	0.434	0.2061[1]	−1.104	0.987	1.48
		(41.6)	(4.55)	(26.4)		
(2) Processed foods	/o/	1.420		−1.645	0.985	0.40
		(32.6)		(203)		
	/e/	1.284		−1.659	0.984	0.67
		(39.3)		(191)		
(3) Clothes	/o/	1.121	0.425[3]	−2.120	0.997	0.87
		(72.7)	(6.62)	(34.4)		
	/e/	1.152	0.487[3]	−2.176	0.999	1.07
		(135)	(9.02)	(41.7)		
(4) Consumer durables	/o/	2.453		−3.788	0.987	0.76
		(35.3)		(293)		
	/e/	2.782		−3.751	0.992	0.70
		(53.4)		(271)		
(5) Furniture	/o/	2.399	1.352[4]	−5.625	0.939	0.23
		(8.64)	(0.84)	(3.59)		
	/e/	2.244	1.850	−6.117	0.971	0.27
		(18.3)	(1.76)	(6.05)		
(6) Household operation	/o/	1.309		−4.033	0.983	0.53
		(30.3)		(502)		
	/e/	1.430		−4.021	0.990	0.46
		(49.0)		(519)		
(7) Personal services	/o/	1.664		−2.747	0.994	0.85
		(51.2)		(454)		
	/e/	1.646		−2.748	0.997	0.85
		(93.2)		(586)		
(8) Health and education materials	/o/	1.076		−3.569	0.970	1.11
		(22.7)		(404)		
(2') Foods: (1) + (2)	/o/	0.766	0.133[2]	−0.644	0.999	1.96
		(105)	(2.44)	(12.2)		
	/e/	0.722	0.119[2]	−0.636	0.997	0.76
		(90.4)	(1.46)	(8.06)		
(8') Health and education,	/o/	1.241		−2.282	0.993	0.67
		(47.6)		(471)		
materials plus wages	/e/	1.089		−2.297	0.982	0.15
		(36.3)		(289)		

/o/: 1955–71, /e/: 1955–79

1) $S'_{1,t} = S_{1,t-1}$

2) $S'_{2,t} = 0.367 S_{1,t-1} + 0.633 S_{13,t}$

3) $S'_{3,t} = S_{12,t}$

4) $S'_{5,t} = S_{7,t}$

(2) A positive value for the coefficient of the supply shortage variable was obtained for such items as nonprocessed foods, total foods, clothes, and furniture. The supply shortage variable for food items was significant when the ratio of actual to capacity output of agriculture with a one-year lag was used.

Results of the reestimation of equation (5.1) based on the extended sample period, 1955–79, are given in rows /e/ of **Table 3**. It can be easily seen from a comparison of the o- and e-estimates that the two are remarkably close to each other. Therefore, it may be concluded that, as far as broad consumption categories like those used here are concerned, there was practically no structural change in consumption behavior within the Soviet economy, even in the late 1970s when there was a general decline in the rate of technical progress. It is also interesting to note, as was found in the study for 1955–71, that the total consumption elasticity of total food consumption, 0.722, is on the high side when compared with corresponding findings for market-economy countries, and that the supply shortage played an important role in cutting back consumption expenditure for the relevant consumption item.

6. CONCLUDING REMARKS

Reestimation of the Soviet model using the extended sample period, 1950–79, has revealed substantial stability in the estimates for the coefficients of the structural equations. The new estimates for the capital elasticities of the production functions are very close to the previous estimates based on the years 1950–69. The new estimates for the long-run accelerator of the investment functions are fairly comparable with the previous ones, though the former tend to be somewhat smaller than the latter. There is practically no difference between the previous estimates and the new ones for the consumption functions. On the other hand, a distinct downward tendency in the rate of technical progress is noticed after approximately 1970. These findings suggest that the recent changes in the rates of economic growth are due to an overall slowdown in the rate of a term interpreted as "technical progress" throughout the Soviet economy.