

# Administrative Monsters: Yurii Yaremenko's Critique of the Late Soviet State

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## *Terra Incognita*

In 1983, speaking at a plenum of the Central Committee of the Communist Party, General Secretary Yuri Andropov confessed, "If we speak openly, we do not sufficiently know the society in which we live and work, have not fully revealed its inherent laws, especially economic." Yet two years before Andropov's admission, a book had appeared that attempted just that. *Structural Changes in the Socialist Economy* (1981) and its author, Yurii Yaremenko, never achieved much fame or notoriety. Yaremenko wrote first and foremost for higher party leadership, secondarily for other planning economists, and almost never for the general public. He had only a moment of public visibility, when he was elected to the Central Committee in 1990 and appointed an adviser to Mikhail Gorbachev in 1991. Yet Yaremenko and his research group began neither from the ideology of Soviet planning nor from a comparison or analogy with capitalist markets. His theory was simply a theory of the planned economy on its own terms, buttressed by a unique data set, and analyzed with a novel econometric model.<sup>1</sup>

However, it was also more than that. Yaremenko remained a communist and proponent of planning until his death, but his theory contained a

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1. In this it is best compared to János Kornai's (1980) contemporaneous work.

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critique of the Soviet system. It showed how the Soviet economy had entered a cul-de-sac from which it was unable to reform its way out. Yaremenko believed that starting in the 1960s, as “extensive” sources of growth were becoming exhausted, the state lost its coherence, and the Soviet economy ceased, in any real sense, to be planned. The industrial structure became distorted, bent toward the runaway growth of the politically untamable military-industrial complex. Without central control, the structural shifts required to sustain growth became impossible.

Such a critique could hardly be published. When Yaremenko received his copy of the published book, cut by a third by the censor, he felt “bitterness and regret.”<sup>2</sup> But while much remained unwritten, it was not unsaid: Yaremenko’s narrative of Soviet political economy diffused via the oral culture of Moscow economics into higher party leadership. Despite the omnipresence of the language of Marxism, Soviet intellectual life was, to an extent unimaginable in the West, bereft of social science. Economics was nearly the only one and was subject to heavy censorship (and much of the discipline remained concerned only with legitimating sloganeering); while there was some ethnography, political science and sociology, at least until the late 1970s, could barely be said to exist. Insofar as research economists wrote for broader publics, they were constrained in what they could say. But more could be and was said among elite scientific and political audiences, and Yaremenko’s theory was one of the most important ideas in circulation among late Soviet elites. It was the only one with a strong statistical base, and perhaps the only one that offered a quantitatively grounded narrative of the grand arc of Soviet development.

Among those it strongly influenced were many of the “young reformers,” the group of economists led by Yegor Gaidar, who, as Boris Yeltsin’s first government, dismantled the planned economy. To them, Yaremenko’s theory explained why market socialist reforms proposed by the 1960s reformists had remained unrealized. From the mid-1980s they developed a microeconomic supplement to Yaremenko’s macroeconomic vision. Convinced that reform was impossible, they embraced the transition to capitalism. And Yaremenko’s work continues to influence the Russian government. As the 1990s reformers have gradually left politics, leadership of the Ministry of Economic Development has repeatedly fallen to economists trained in Yaremenko’s Gosplan tradition. Against the Gaidar

2. Some of his work was posthumously republished, including part of the uncensored manuscript (Yaremenko 1997, 1999, 2000; see also speeches at the presentation thereof in *Predstavlenie* 1998).

liberals, they have advocated a strong developmental industrial policy. In other words, both Russian economic liberals and their *dirigiste* opponents began their intellectual trajectories in dialogue with Yaremenko's theory and analysis.

In what follows, I briefly outline Yaremenko's biography, focusing on the historical contexts in which his work appeared, before turning to his major book. I end with "the esoteric text" that Yaremenko could not publish but which, circulating orally, helped shape the political views of multiple camps of the post-Soviet elite.<sup>3</sup> Here I draw on sixteen interviews conducted by a junior member of his institute, the economic sociologist Sergei Belanovskii, published as *Economic Conversations* (1998), and my own interviews.<sup>4</sup>

### From Gosplan to the Complex Program

Yurii Vasil'evich Yaremenko was born on August 8, 1935. He entered the economics faculty of Moscow State University in 1953, but spent his fifth year of study at Chinese National University in Peking, from which he received his diploma in 1960.<sup>5</sup> From a year after its 1959 founding, Yaremenko worked at the Scientific Research Economic Institute of the State Planning Committee (NIEI Gosplan), where he published his first books heralding the direction of his life's work.<sup>6</sup> In 1973 he moved to the Central Economic Mathematical Institute (CEMI), the heart of Soviet mathematical reformist economics, before joining the newly formed Institute for the Forecasting of Scientific and Technical Progress in 1986. Yaremenko's intellectual trajectory must be understood through these institutions, crucial to Soviet thought and policy.

3. Beyond published sources, I rely on interviews with Yaremenko's former collaborators Emil B. Ershov, Anatoly Smyshlyayev, Vladimir K. Fal'tsman, and Ada Nikolskaya, and with Clopper Almon; I also draw on interviews with Genadii Kuranov, Viacheslav Shironin, Andrey Nechaev, Vitaly Naishul, Sergei Vasiliev, and Yurii Rodny.

4. His only two translated publications of which I am aware are Yaremenko, Lavrenov, and Sutiagin 1974 and Yaremenko, Ershov, and Shmyshlyayev 1980. The only English-language mentions I have discovered are—tellingly—by a scholar of the Soviet/Russian defense industry, Julian Cooper.

5. He retained an interest in Chinese development rare among Soviet economists, the vast majority of whom oriented intellectually toward the "advanced" countries. His second published work was *The "Great Leap" and the People's Communes in China* (1964).

6. *Regularities of the Dynamics of Social Product and National Income* (with B. P. Plyshevskii, 1963) and the collaborative work *Rate and Proportions of Economic Development* (with A. I. Anchishkin, 1967).

After Joseph Stalin's death (1953) and Nikita Khrushchev's denunciation of Stalin's "cult of personality" at the Twentieth Party Congress (1956), a reformist economics began to coalesce. It was inextricable from the contentious introduction of more advanced mathematical technique. The mathematics came in two flavors, input-output modeling and optimization theory, around each of which formed a community of researchers, which, in the 1960s, were roughly based in NIEI Gosplan and CEMI, respectively. Optimization methods entered economics with young mathematicians transferring from military research institutes, and represented both in styles of reasoning and in mathematical apparatus a more severe rupture with what had come before (Leeds 2016). Due to its similarity to midcentury Western mathematical economics, this research has received nearly all attention devoted to Soviet economics.<sup>7</sup> But at NIEI, research centered on Wassily Leontief's input-output model.<sup>8</sup> Soviet economists were already accustomed to reasoning about quantified economic aggregates representing an economy of interdependent industrial branches, locked into proportions dictated, ultimately, by the technical characteristics of their production processes, and growing along the time-path determined by the reinvestment of output across sectors in a circular flow. Leontief's model cast these habits of reasoning into mathematical form. Its virtuosi, like Yaremenko, became the true theoreticians of the actually existing planned economy.

Yaremenko's retrospective analysis actually emerged from the movement for forecasting. In 1965 Emil B. Ershov procured NIEI Gosplan's first computer, and Aleksandr I. Anchishkin began a campaign to legitimize long-term forecasting. Anchishkin's work found support in the highest leadership: in 1965 the chairman of the Council of Ministers, Aleksei Kosygin, in a speech at Gosplan, called for plans to be based on forecasts. NIEI Gosplan began to create a methodology for forecasting, while Anchishkin propagandized in print.<sup>9</sup> Gosplan's leadership remained resistant to forecasting, but NIEI Gosplan pushed forward, building allies in the Academy of Sciences through CEMI director Nikolai Fedorenko's

7. Among the most useful Soviet-era works are Zauberman 1975, 1976; Katsenelinboigen 1980; Sutela 1984. For recent English work, see Boldyrev and Kirtchik 2017, though I disagree with their division of the epistemic field, and Ericson, this volume, and in Russian Belykh 2007 and Shukhov and Freidlin 1996.

8. See Kossov 2014; Strizhkova 2011; Belykh 2007. For a Soviet survey after the first generation of work, see Baranov et al. 1967. The only substantial English writings on Soviet input-output analysis are Trembl 1967 and Tretyakova and Birman 1976.

9. Respectively, Kosygin 1965 and Anchishkin and Ershov 1966, 1967.

Scientific Council on the Complex Problem of Optimal Planning and Management of the National Economy.<sup>10</sup> Finally, in 1972, the Central Committee (or a short-lived top-level council of scientific advisers) initiated the Complex Program for Scientific and Technical Progress and its Socioeconomic Consequences to create twenty-year forecasts of Soviet economic development updated every five years.<sup>11</sup>

Anchishkin, having allied with Fedorenko to push forecasting and tired of the resistance from Gosplan leadership, left NIEI Gosplan to head a new division created for him in CEMI, and took his friends and colleagues with him, including Yaremenko and Ershov. Coordinating the Complex Program was in some sense the *raison d'être* for Anchishkin's department, and in another sense its cover (*krysha*), or source of protection, patronage, and funding.<sup>12</sup> The program was a scientific megaproject, jointly subordinated to the Academy of Sciences and the State Committee on Science and Technology (GKNT), the coordinating body for industrial research policy. It was the largest civilian program of the academy, directed by a council of more than one hundred high-ranking scientists and bureaucrats, and chaired by the academy's vice president, the great information theorist, radio engineer, and astronomer Vladimir A. Kotel'nikov. His vice chair was the deputy director of GKNT, former minister of the chemical industry, Sergei M. Tikhomirov. Fedorenko, Shatalin, and Anchishkin all sat on the leadership council. A series of subcouncils divided the work by scientific topic or branch of production, each chaired by a leading scientist.<sup>13</sup> In turn, they requested data, answers to questions, reports,

10. For the history of Anchishkin and his school, see Savchenko 2013; Klepach and Kuranov 2014. For the legitimization of forecasting, see Ershov's contribution to Savchenko. Fal'tsman's autobiography (2007) describes what it was like to work with Anchishkin.

11. The Complex Program's history is yet to be written. For some information, see Savchenko 2013 and relevant sections of Fal'tsman 2007, and Fedorenko 1999. Fedorenko (1999, 373) claims that the program was initiated after his meeting with Politburo member Andrei P. Kirilenko.

12. This division consisted of five laboratories: Anchishkin's focused on long-term forecasting using production functions; Yaremenko's studied the sectoral structure of the economy with input-output models; Ershov's laboratory provided mathematical and programming support to the others; Vladimir K. Fal'tsman's studied investment processes; and a fifth, initially the laboratory of Boris Mikhailevskii (CEMI's—and possibly the Soviet Union's—first long-term forecaster) and led after his untimely death by Yurii P. Soloviev. In 1986, in the power struggle among the deputy directors after Fedorenko's removal, the division split from CEMI to form the Institute of Economics and the Forecasting of Scientific and Technical Progress. When Anchishkin died in 1987, Yaremenko became director, a post he held until the end of his life.

13. Fedorenko (1999, 374) numbers 270 scientists on these councils, from ninety different institutes for the first forecast.

technical papers, and summaries from scientists, engineers, and economists in the dozens of academy institutes and hundreds of industrial research institutes. On each subcouncil, a young CEMI economist served as secretary, reporting directly to Anchishkin and Yaremenko, who were in turn in charge of the consolidated economic overview. They summarized the data with a multistage model, generating the final scenarios: first a simple production function generated growth rates and incomes, which were then taken as parameters for an aggregated input-output model, which generated parameters for a less-aggregated input-output model. The final product of the first forecast ran to eighteen tomes.

In some sense, the Complex Program was a failure. It was an unreadable industrial encyclopedia, methodologically ad hoc, and with probably little effect on planning. But it reflected the times' intense emotional and political investment in science and technology, and the ambition of the new wave of policy sciences for managing the future. From the late 1950s, Soviet historians and philosophers had theorized a new "scientific and technical revolution" (STR), inspired by developments in the advanced countries, in which science would become a directly productive force.<sup>14</sup> Talk of the STR entered official discourse and became both an accepted fact and a policy imperative. As Soviet growth slowed in the 1960s, fear of technological lag and hope in technological innovation gripped Soviet leadership. This drove the early-1970s wave of forecasting efforts that flowered in the Soviet Union; like many of the enthusiasms of the period, the vogue for forecasting had a manic quality, promising far more than was ever delivered (Rocca 1981; Guth 2015; Rindzevičiūtė 2015, 2016a; Feygin 2017).

But for Yaremenko and Anchishkin, the Complex Program had benefits. First, they received ample funding and a far greater amount of more granular economic data than any other research economists in the Soviet Union. For Anchishkin, the program underwrote his ambition to create an expansive theory of Soviet social reproduction. Yaremenko, in constant contact with the industrial research institutes and design bureaus, developed an unusual expertise. He was interested in both the technical side of Soviet production, spending endless hours reading trade publications and design bureau white papers, and the managerial side, exhorting his research

14. Such discourses traversed the Iron Curtain; J. D. Bernal's *Science in History* (1954) inspired early Soviet work (and was itself inspired by the work of Nikolai Bukharin and Boris Hessen). See Cooper 1973, 1977, 1979; Josephson 1981; and Rindzevičiūtė 2016b, chap. 1.

group to interview managers and production engineers whenever possible. It was during the period of his engagement with the data generated by the Complex Program that Yaremenko's theory of the multilevel economy came to fruition. But second and, to them, crucially, the program was a channel to the Central Committee, through which they could sound an alarm about the path of the Soviet economy.

### **The Structure of *Structural Changes***

Yaremenko's seminal work, *Structural Changes in the Socialist Economy*, is composed of four parts, each methodologically unique, but building to a single argument. All rely on a unique database of eighteen sector input-output tables in constant prices for the years 1950–75 painstakingly constructed by Yaremenko's team.<sup>15</sup> The full manuscript was completed in 1979, and published in 1981, but it was rooted in earlier work. The first public mention of the data tables dates to 1969; a version of the model first appears in 1975; the heart of Yaremenko's theory first appeared in his doctoral dissertation of 1977.

The first part is a stylized narrative ostensibly built around adjusted five-year average growth rates for each sector and the time-series of the direct coefficients derived from the input-output tables. Yaremenko takes sharp changes in growth rates or direct coefficients as evidence of "structural shifts." His interpretations, however, depend on both the econometric analysis in the book's third part and his deep qualitative knowledge of the Soviet economy. In each period, his narrative traces the shifts and their consequences within relatively independent groups of sectors: (1) energy generation, its major inputs and consumer sectors; (2) construction materials-related industries; and (3) agriculture production and its consumers. There is also a section on the consequences of the rapid growth of the chemical industry in the 1960s.

The book's second part is the theoretical heart, Yaremenko's principal accomplishment. First, he develops a theoretical terminology for analyzing planned, accelerated development and introduces a partial formalization thereof. Second, he sets this into motion, demonstrating, at a highly abstract level, how planned development encounters internal limits, what the choices are for overcoming these, and how they involve sharp shifts in

15. The data set is published in Yaremenko 1999; Ershov's preface explains their provenance. The balances for 1971–75 have been lost.

intersectoral structure. The second part's final chapter shows how a variety of Soviet enterprise behaviors were responses to these macrostructural processes, thereby giving those phenomena a unified explanation.

It was the book's third part that most impressed many Soviet economists. It presents an econometric "model of intersectoral interactions" (*model' mezhostrasleykh vzaimodeistvii*) developed by analogy to an input-output model, estimated over the studied period.<sup>16</sup> The model takes the standard production function for the flow between two sectors and turns it into a regression equation. Then it adds additional terms that make the flow between the two sectors dependent on a series of other factors: the output of the source sector; the output of the destination sector; and the size of flows between either the source or destination sector and some third sector. The model aims to infer the structure of planners' revealed priorities from changes in intersectoral flows over time. The econometric results are thus interpreted as the phenomenology of the theory of the book's second part and are the basis for the stylized narrative of the first part. Yaremenko then explains ways the model can be used for sectoral and general forecasting, which is beyond the scope of this article.

The book's fourth and final part owes the most to Anchishkin. In it, Yaremenko constructs, estimates, and analyzes production functions for the studied period. The goal of constructing these functions was to show that there existed an optimal rate of investment, that is, that investment over a certain rate would yield steadily decreasing returns.

### **The Multilevel Economy (The Exoteric Text)**

#### The Qualitative Differentiation of Goods and the Institution of Priority Ordering

Yaremenko's theory of socialist development begins very simply. Its most basic concept is that of "quality," but it is also one of the most problematic (compare Yaremenko 1981, 61–63, 116–18). On the one hand, Yaremenko defines quality economically: "quality goods" are those with respect to which demand outstrips supply. The opposite is a "mass good," one in surplus with respect to demand for it. But in an economy determined by planners' priorities, demand is not a basic notion. On the other hand, qual-

16. It is likely that the econometric work was done by Smyshlyaev and Ershov. The model's first appearance was in Yaremenko, Ershov, and Smyshlyaev 1975. Subsequent, updated, and more sophisticated versions appeared in the collective works *Metody* 1985 and *Modelirovaniie* 1984. Other relevant papers have been collected in Yaremenko 1997. Ershov 2013 discusses the model's problems and development, and sketches one for the contemporary Russian economy.



ity is defined technologically, either with respect to a unilinear scientific-technological advance or as superiority of some means for achieving some goal. The heterogeneous quality structure of an economy, Yaremenko believes, is one of its most conservative characteristics, changing only slowly. The planned economy is a mechanism to act on this quality structure, to force the development of the productive forces, to hurry through the historical time already traversed by more advanced countries.

The correlate of quality is “priority.” All enterprises that consume any quality good can be ranked by the priority accorded to them by planners for consuming that good. One sector is higher priority than another if its share of quality goods increases more than that of the other with an increase in the availability of priority goods,

$$\frac{\partial \left( \frac{Q_\gamma(\bar{R})}{Q_\gamma(R)} \right)}{\partial \bar{R}} > \frac{\partial \left( \frac{Q_\delta(\bar{R})}{Q_\delta(R)} \right)}{\partial \bar{R}}$$

where  $Q_\gamma$  and  $Q_\delta$  denote consumption in enterprises of differing priority levels  $\gamma$  and  $\delta$ ,  $R$  is a total quantity of resources consumed, and  $\bar{R}$  is a quantity of quality resources. Yaremenko assumes a notion of technical complementarity: production processes that require multiple inputs will tend to require inputs of similar quality levels (including labor and the consumption goods it requires). Groups of producers can therefore be roughly ordered with respect to all goods. Priority groupings are thus independent of and crosscutting the division of the economy into sectors (however, in practice, he often takes them as equivalent). This priority ordering defines the “multilevel economy”—Yaremenko’s preferred title for his book, changed by the editors. Yaremenko was thus able to precisely define “structural shift”: a structural shift takes place when planners reallocate some scarce good or, which is the same thing, change the priority of some enterprise(s) for the allocation of some good (63–66).

Crucially, the priority ordering of the economy cannot be identified with the priorities of the planners but is rather the *revealed priority ordering*, worked out not just through the plans and the formal mechanisms for their fulfillment but also by informal bureaucratic power struggles over resources. The gap between planned priority and actual priority is where Yaremenko hides much of the critical power of his theory.

Yaremenko then defines two processes with respect to the levels of quality goods and the prioritized producers that consume them. These processes are not mutually exclusive, and policy goals can require a combination of the two effects, bringing at least three priority levels of producers into play.

The first is the “compensation effect”: the diversion of lower-quality goods to a higher-level production process. Because production processes can substitute at least some of their inputs with those of lower quality while maintaining the quality of their output, compensating flows relax a priority level’s resource constraints, accelerating its growth. Compensation thus forces the expansion of existing high-priority levels and accelerates the emergence of new, ever higher quality levels. The higher the priority of a group, not only the higher its quota of quality resources, but also the higher the level of lower-priority groups from which it can demand compensating resources. Demand for compensation flows, driven by demand from the top of the priority ordering, is passed lower and lower down the ordering, involving finally mass resources, those in absolute surplus. The presence of mass resources is thus the condition for the possibility of imposing a priority ordering, and of planned, forced development at all (Yaremenko 1981, 66–69).

The “coefficient of compensation” represents the degree to which, at a given quality level, productive consumption of quality resources relatively decreases as consumption of mass resources increases:

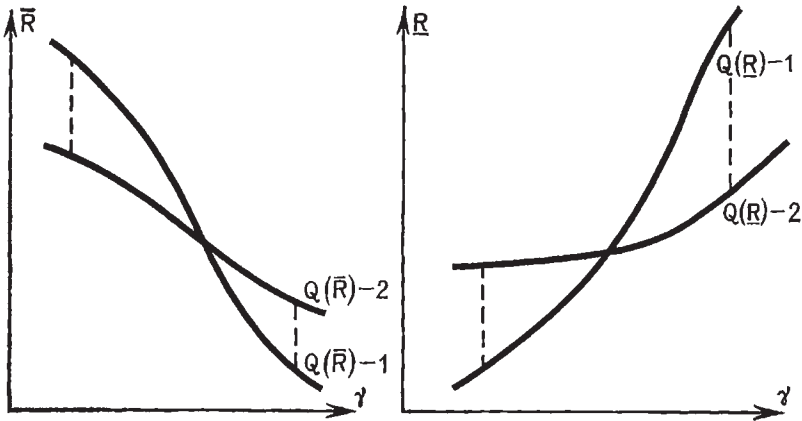
$$q_\gamma = \left| \frac{\delta Q(\bar{R})}{\delta Q(R)} \right|.$$

Accordingly, the “national economic coefficient of compensation” is the average of the coefficients of each level weighted by the share of that quality level’s consumption of mass goods out of the total volume of mass goods:

$$q = E(q_\gamma) = \sum_{\gamma=1}^{\omega} q_\gamma \frac{Q_\gamma(R)}{\bar{R}}.$$

An economy with a higher coefficient of compensation concentrates a greater proportion of quality goods in its priority industries, making them scarce elsewhere, and compensating for them by increased use of mass resources. This economy is expressed in the figures below by the lines labeled 1; the left figure is the consumption of quality goods by level ( $\gamma$ ), and the right figure is the consumption of mass goods by level.

The second is the “substitution effect,” the directing of higher-quality goods downward to a lower-priority group formerly unable to obtain them. The effect of a substituting flow is to renovate the lower-level productive processes. Substitution flows not only raise the quality of a level; they can cause low levels to disappear entirely, reducing the number of levels in the economy (69–72).



**Figure 1** Source: Yaremenko 1981, 68.

Interlevel flows have two characteristics. The “depth” of a flow is the number of levels that it spans. The interplay of substitution and compensation effects in the economy over time is structured by the diminishing returns of each as the depth of flows increases. While, for instance, large amounts of unskilled peasant labor could be used in a compensating flow to expand steel production during the initial stages of industrialization, it cannot be used to even marginally expand output of high-precision gyroscopes. Changing the source of compensation flows from bottom to intermediate levels is one way to decrease their depth, but the other is to implement a “structural shift”: to direct substituting flows down to a lower level serving as a source of compensation in order to increase its level. Conversely, with respect to substituting flows, there is a limit to the quality of goods that can efficiently be used to improve the production processes of low-quality levels. While, for instance, the machinery in a sausage factory could indeed be machined from titanium, its special qualities would be mostly wasted. The increasing depth of interlevel flows also incurs secondary “collateral costs,” when the mismatch in quality of inputs leads to wastage or defects; these collateral costs determine a maximum possible depth. The “intensity” of compensating or substituting flows, the second characteristic, is defined with respect to a priority level as the proportion of that level’s output flowing to a level of a different priority. The average intensity of substitution and/or compensation of an economy,

$$I_1 = \frac{\sum_{\alpha < \gamma} Q_{\alpha\gamma}(R)}{\sum_{\gamma=1}^{\omega} Q_{\gamma}(R)}$$

and

$$I_1 = \frac{\sum_{\gamma < \alpha} Q_{\gamma\alpha}(R)}{\sum_{\gamma=1}^{\omega} Q_{\gamma}(R)}$$

are thus measures of the degree of forced structural transformation underway.

### Forced Development, Structural Shifts, and Objectively Necessary Plans

This vocabulary enables Yaremenko to describe the structural changes of an economy undergoing forced development. His theory, though pretending to be merely descriptive, was obviously an intervention into debates about the deceleration of Soviet growth after the postwar reconstruction. From the moment of Stalin's interment, economists, managers, and politicians had proposed schemes ranging from technical fixes to enterprise accounting, to bureaucratic reorganizations, to moonshot-level dreams of nationwide cybernetic networking. By the 1970s, steadily decelerating growth had become a constant worry, inciting calls for ever more drastic measures within the increasingly restrictive ideological limits.

Approaches centered on firm behavior (through rejiggering accounting, assessment, and reward, and/or through a complete reform of the price system) came under the label of "the perfection of the economic mechanism." Overlapping approaches sought "optimal planning" via mathematical modeling and computer simulation. Both approaches zeroed in on allocational efficiency; this was how neoclassical economic reasoning, Walrasian equilibrium theory, and its mathematical apparatus became coupled to Soviet debates. Eventually, these reformisms stimulated new visions of socialism—market socialisms and optimal planning's "indirect centralism"—that began not with the classical historicism of increasing production unto utopian plenty but with the neoclassical scientificity of Paretian optimal static efficiency.

But another, less sharply defined, line of thought—the one to which Yaremenko most properly belonged—sought solutions in changing investment priorities, the reorganization of industrial research and development, and incentives for enterprises to adopt new technologies in production.

Here, two major ideologemes of the post-Stalin years dovetailed. The first was the problematic of “intensive” versus “extensive” development, which was one way of expressing policy questions that could not be discussed entirely openly: declining growth rates, the growing technological lag compared to the West, increasingly visible pathologies of firms’ behavior, consumer goods shortages, and correspondingly low labor productivity. In extensive growth, more resources are brought into production, and productive capacity and thus output increase rapidly. But once these resources are absorbed, growth becomes proportional to natural population increase. Under intensive growth, resources are used more efficiently, productivity rises, and output, while it may also grow, increases in quality and sophistication. Yaremenko instrumentally employed this already established language, despite it not meshing well with his conceptual architecture.

The second ideologeme, introduced in the late 1950s, was the STR: the wave of scientific and technological innovations theorized to be revolutionizing the industrialized world. The transition to “intensive development” here was understood less as the reforming of the “economic mechanism” so as to incentivize efficiency than as coupling production to science and technology. The “transformation of science into a productive force” was thought to herald the long-anticipated possibility of transition from socialism, the initial phase of postcapitalism, to the communist future.<sup>17</sup>

Existing Soviet growth theory began from Karl Marx’s two departments of producer goods and consumer goods and was expressed canonically in Fel’dman’s (1928a, 1928b) two-sector growth model. It called for concentrating investment in the producer goods sector and reinvesting most of its output into itself. Restraining consumption in the short term to expand primary productive capacity would lead to higher growth rates—and consumption—in the long term. Yaremenko subsumed this as a special case, corresponding to the “take off” stage of industrialization, by reconceiving the division of production into Marx’s two departments as the two levels of priority versus nonpriority production, quality goods versus mass goods.

17. These ideologemes could be combined with that of the perfection of economic mechanism. As the argument went, directive physical planning was appropriate to extensive growth, but the STR and the transition to intensive growth that it enabled or required necessitated economic governance via (to indicate the variety of terms used) indirect, economic, or “commodity-money” mechanisms.

In the first stage of industrialization, high-intensity compensation flows lead to very rapid expansion of the higher level (from a low initial level); as the quality frontier pushes outward, intermediate levels emerge. This qualitative transformation of the economy, “a process of changing the composition of resources, their self-reproduction with constant precipitation of qualitatively new elements” (94), is Yaremenko’s understanding of growth. In the age of the STR, economic growth invited conception as an acceleration of techno-historical time, indexed by qualitative change. Quantitative growth is logically derivative of the proportions of quality levels necessary to support a given rate of qualitative transformation (90–96). But qualitative growth causes the depth of the compensation flows to grow, their effectiveness to drop, and more mass resources to be required to continue to expand quality production. As the effectiveness of compensation from the lowest levels falls, newly created intermediate levels become the source of compensating flows for the even newer highest levels; their goods thus become scarcer, and distributed according to priority. Until this point, the intermediate levels had received relatively weak development, just enough to enable the emergence of new highest technical levels. In some sense the economy still approximated a two-level structure. But as demand for compensation from intermediate levels grows, investment in them must grow to expand their output. From two levels, the economy assumes a pyramidal shape. The two-sector growth model, descriptive enough of early extensive growth, no longer adequately captures the structure of the economy or the transformations it must undergo (87–94).

As the economy’s structure grows more complex, maintaining proportionality requires transition to “intensive development” (96–98). Balanced, intensive growth involves a constant interaction of both compensating and substituting flows. As the technical frontier expands, and new quality levels emerge, quality goods must be substituted downward to renovate lower levels. In intensive development, growth as measured in output may slow. But production processes change, and a different assortment of goods of a higher average quality are produced. This includes consumer goods demanded by the more educated and cultured workforce required by high-quality production.

The very success of priority-driven forced development thus creates a multilevel economy that cannot grow further unless it transitions to a different regime of growth. In addition to the external limits to extensive growth, that is, the exhaustion of primary resources, the developing economy poses an internal limit to itself. It is in this sense that Yaremenko can

speak without contradiction of *objective* economic requirements in a planned—that is, subjectively determined—economy.

### The Microstructure of Production under Extensive Growth

The power of Yaremenko's theory appears most startlingly in his elaboration of how the multilevel macrostructure materializes in the microstructure of production. He examines peculiarities of the Soviet firm often viewed as pathological and explains them as the result of forced development. These are sometimes taken as a sign of the unviability of socialism, but for Yaremenko, socialism is a fact, its viability demonstrated by its actuality. While these firm behaviors may be "pathological," in some sense, they correspond to forced qualitative transformation. The more the economy qualitatively differentiates, the higher the coefficient of compensation, the more Soviet enterprises will express these characteristics. The microstructure of production and the macrostructure of the economy were two sides of the same coin.

During extensive growth, production processes are oriented toward (1) *specific types of technologies* that maximally utilize surplus unskilled labor and minimally utilize high-quality capital goods (Yaremenko 1981, 103–5). Labor intensive and elastic with respect to labor production processes persist despite the availability of more productive, less wasteful processes. The labor and resource-intensiveness of Soviet manufacturing thus conditioned the hypertrophy of raw material-producing industries and the fuel and energy sectors.

Further, widespread compensation requires the use of what Yaremenko calls (2) *universal technologies* (105–6). In early industrialization, reliance on unspecialized production processes is unavoidable: far more types of goods are needed to support the growth of the priority sectors of the economy than can be produced at efficient scale, especially given the general shortage of investment. But production for compensation reinforces the preference for universal technologies. Producers of compensating goods must be prepared to regularly change over their line to produce small batches of goods needed by higher-priority consumers; high-priority consumers must have equipment that not only can produce a large range of high-quality goods but can tolerate lower-quality inputs. Universal technologies in turn exacerbate the wastefulness of Soviet manufacturing.

The qualitative ordering of the economy also explains the oft-noted drive of the Soviet firm for (3) *relative economic isolation* (106–8). Because of the technical complementarities of production, firms either form supply links with other firms of the same or proximal quality levels, or develop auxiliary production lines in the firm itself. In the first case, the need to maintain relative qualitative homogeneity among a network of interlinked firms means either that transportation costs increase to connect far-flung firms or that firm sizes are kept smaller than economies of scale would otherwise dictate. In the second, firms producing high-quality goods (4) *diversify their production* beyond their planned product mix to manufacture supply of sufficiently high-quality inputs to their main line (108–9). Thus, the peculiar way that Soviet enterprises sprouted, surrounding themselves, an endless array of small-batch preparatory production lines, repair shops, tool shops, and finishing lines, with enormous inventories of spare parts, half-processed inputs, unfinished outputs, and so forth. These interlinked facilities maintained that “technological core” of the firm at a certain quality level, surrounded by a periphery of decreasing quality production (ending in warehousing and transport), in a sort of firm-internal replication of the qualitative differentiation of the macro-economy (112–13). This structure is even fractally replicated within individual shops, which can have their own repair or auxiliary bays, transport, storage, and so on. The despecialization of main production lines that must produce a wide assortment of outputs (their “multi-profileness” [*mnogoprofil'nost'*]) induces even more severe despecialization in those auxiliary lines. This peculiarly despecialized nature of Soviet industrialization gives rise to *second-order compensation costs* from warehousing intermittently available supplies, creating idle auxiliary productive capacity, warehousing inputs and products of that auxiliary production, repeated rerigging of lines for small-batch production, and long-distance transportation.

### Structural Stagnation

The transition to intensive development can be managed without undue strain if undertaken before the national compensation coefficient or the average depth of compensatory flows grow too large, and before mass resources are exhausted. The deliberate increase of cascading substitution flows would enable the qualitative enhancement of lower levels, which in turn would reduce the depth of compensation flows, restoring their efficacy, and enabling the continued qualitative development of the upper levels. This virtuous cycle would enable the economy to pull itself up by its bootstraps.



But if the structural transformation to intensive development is delayed, the elevated growth rates of the upper levels maintained too long, “balancedness” or “proportionality” becomes badly violated, and the economy evolves in a way that makes the needed transformations more difficult to achieve. Firms producing goods used for compensation devote an increasing portion of their production to those upward flows, either expanding production or forcing their same-level consumers to compensate with other yet lower quality inputs. The strain of compensation thus gets passed level by level to the bottom—the extractive industries, raw materials, fuel—which enter into hypertrophied growth. The base of the priority pyramid widens. But the expansion of labor-intensive forms of production of low-quality goods that compensate for shortage of quality inputs runs up against a limit: the shortage of priority goods is ultimately manifested in a general labor deficit. Exhaustion of basic mass resources, including labor, but also fuel, ore, and so on, thus constrains this hypertrophy of the base of the pyramid; compensation can then only be maintained by intensifying it, that is, by increasing the share of lower-quality production destined for higher levels.

As lower-level production expands, the already inadequate supplies of quality inputs provided to these lower levels become insufficient to reliably maintain the quality level of their output. Lower- and intermediate-level enterprises adapt by simplifying the products they make, shifting the assortment of their output to less labor-intensive substitutes and narrowing that assortment by ignoring the differentiated demand of their consumers. For all these reasons, a form of inflation—a *verboten* word in Soviet economics—sets in, one manifested not in rising prices but in falling quality (116–18).

The higher levels of the economy react by isolating themselves, producing their own inputs and hoarding available inputs and labor. The “overload” (*peregruzka*) induces exaggerated, pathological forms of the firm behaviors characteristic of extensive development. The longer the imbalances persist, the worse they become, the more the firms adapt to them, the more difficult and expensive become the eventual structural shifts required for intensive growth. The economy enters into a cul-de-sac.

This analysis never mentions the Soviet Union. It is written in the subjunctive mode—if this should happen, then that would follow—and phrased at a level of theoretical generality such that it could apply to any economy undergoing forced development. This was as much as Yaremenko could indicate in print. But it is a description of the development of the Soviet Union meant to function as an alarm.

### The Pyramids of Egypt (The Esoteric Text)

From the second half of the 1960s, Yaremenko (1998, 84–85) saw the Soviet Union as on a disastrous, even tragic, path. His exoteric theory described the logic of development of the Soviet economy, but his esoteric theory of Soviet institutional transformations explained how overdevelopment of military industry led to a loss of control over the trajectory of development and, finally, how that development mutilated the lives of Soviet citizens, cannibalizing the nation's future.

The rationale of the Soviet system was, Yaremenko believed, extra-economic: geopolitical competition, *raison d'état*: “The planned system was, to some extent, a derivative of an extra-economic function” (40). The economy was oriented to the arms race. Until the late 1960s the Soviet Union could keep pace (64). But its successes in atomic weapons and rocketry led to overweening ambitions that it could not fulfill. This was a problem, but what turned it into a disaster was the weakening of central party control that would have enabled the de-escalation of the arms race and the reallocation of high-quality productive capacity toward intensive development and civilian production.

In the system bequeathed by Stalin, coherence was maintained through two agencies, the Communist Party and the State Planning Commission, Gosplan. The party was, said Yaremenko, the custodian of the general political interest, the arbiter among the warring agencies. A line divided the party from the industrial managers [*khoziaistvenniki*], but it gradually faded. The “priestly caste,” as he called it in almost Weberian terms, “lost its birthright, its moral authority, and the authority of power” (29). From the early 1970s, the party became not only unable to enforce the general state [*obshchegosudarstvennyi*] interest, but itself became one interest among many (28). The de-universalization of the party enabled sections of the state-economic apparatus to become increasingly autonomous, to fight for their own expanded reproduction (27). This initiated a vicious circle: as the “administrative monsters” (as he dubbed them) grew more autonomous, they effectively captured sections of the party, weakening further its ability to contain them. The most powerful of the monsters were the military industries. Yaremenko dates its final apotheosis to the term of Minister of Defense Dmitriy Ustinov (1976–84), who was promoted from military industry, not the armed forces, and who launched a myriad of weapons superprograms (39). The military industrial ministries, on a runaway growth path, expanded to the limits of available

resources, blindly copying Western technological innovations (64–65). With the loss of control, the arms race begun to serve the economy's extra-economic rationale—raison d'état, military competition—became an irrational goal in itself (65).

Gosplan was the other universal arbiter of the system. The planners had two tasks. The first was to implement the priorities necessary for international competition, even as they transformed into supporting the military ministries irrational growth. But the second was to take the point of view of the economy itself: to keep the structural imbalance, the overload, within the limits required to maintain the country's "life support systems" (71–72), and to expand the technological frontier along the lines of "a certain technological image of a contemporary state, which was supported absolutely irrespective of any final economic demands" (69, 82). Each task effectively created a queue, and at the highest level the work of Gosplan was to reconcile these two queues into one (41). All the political power lay with the first queue, the military industries, and they would win unless Gosplan put its own weight on the scales in favor of the second, the civilian sectors.

The intensity and depth of compensating flows to the military industries led to the structural overstrain that Yaremenko had described in his book without naming its cause, manifested in the hypertrophic growth of the fuel and metallurgical industries (106–7). As these sectors hit limits to extensive growth, efforts were made to intensify them, with investments in nuclear power, gas, and oil, and in aluminum and plastics. But these were insufficient, and the compensation coefficient fell (81). Civilian mechanical engineering atrophied, undergoing a quality inflation visible in its wastefully produced, low-quality equipment: "Civilian industry began its fictitious development on an empty resource space. And it had its own inertia, potential for bureaucratic growth. Fiction manifested itself in fictitious plans, in fictitious reports, etc." This, he says, was the "main plot" of *Structural Changes* (40). Finally, Yaremenko rejected the usual story that the economy's increasing complexity required more complex management than the planned system could provide. Rather, the structural crisis drove the crisis of management: overstrain of the economy was reflected in the increasing complexity of the planning and control apparatus, an explosion of statistics and paperwork, out of proportion to the growth in the complexity of the economy itself (150–51).

To Yaremenko, therefore, there was a semantic error in using the word *economy* [*khoziaistvo*] to apply to the Soviet Union. In a striking passage, he mused,

Describing these processes, I feel a certain dissatisfaction because of the lack of an adequate description language. Strictly speaking, we are not talking about economic phenomena—rather, they should be understood in terms of sociology. The resilience of our economy in relation to the reproduction and expansion of the administrative and social structures mentioned by me is a problem that no one has correctly understood and appreciated until now, because we are used to living in the speculative world of economic determinism. And it is hard for us to realize that our society was more like not Europe or America, but rather ancient Egypt, where the construction of the pyramids was the cementing element of the whole Egyptian civilization. So our economy in its development did not have any internal meaning, but was only a kind of space for the reproduction and expansion of administrative structures. (28)

The Soviet Union was a “productive organism,” but it was not an economy; it did not operate according to specifically economic assessments of courses of action (77–80). Its logic was one of the expanded reproduction of administrative structures, accomplished by expanding the productive capacities that were their supposed *raison d’être*, guided by an extra-economic goal, and finally by no goal at all. Thus, by 1985, there was no hope of avoiding economic crisis, because its sources were *not* economic but political and institutional (63).

But for Yaremenko the ultimate tragedy of this teratoid growth was what it did to the Russian people. By the 1970s the huge demand for unskilled labor at the base of the quality pyramid, at that time beginning its terminal hypertrophication, could no longer be easily met. The waves of rural labor set free by collectivization and mechanization of agriculture had been absorbed. With the winding down of the gulag system, the coercive threat disappeared as well (Yaremenko 1998, 107). The Soviet Union solved this unskilled labor shortage not by paying higher wages (ideologically impossible beyond certain limits) but by creating a gradient in the quality of life between the city and the village—“a hierarchy of social environments” (110). The most select environments were the closed cities of military science (*naukogrady*), followed by Moscow and Leningrad, then lesser cities, ending in the countryside, where people lived almost entirely outside the graduated state system of guarantees and provisioning, getting by mostly through subsistence agriculture. This was the “pump” drawing people to the city.

The mechanism to keep an increasingly educated and skilled populace in low-skill jobs was the residency permit (*propiska*) system. Without the appropriate *propiska*, it was impossible to receive housing in “regime cities” (*regimnye goroda*). Industries suffering labor deficits were given a quota of temporary permits conditional on continued employment, and workers would receive an urban *propiska* after some number of years working. Military engineering had quotas enabling talented graduates of mathematics and the sciences to stay in Moscow if they would work in military research and development—a mechanism for implementing priority ordering in the highest-quality labor. But on the low end were jobs like construction. Ambitious and increasingly well-educated people came to the cities and, to earn their *propiski*, took these unskilled jobs. Pay, productivity, and morale were extremely low. Many workers repeatedly lost their jobs and took new ones, serving multiple terms, becoming “ground down, deformed, partially degraded” (46), ever less disciplined, yet repeatedly rehired due to the endemic labor shortage. Dormitory districts populated by these workers became known for alcoholism and low-level criminality; Yaremenko (1998, 44) called them “a kind of school for acquiring antisocial skills.” Many workers would eventually earn their *propiski*, but even so they would be marked by their work experience. For Yaremenko (1998, 115), it is “no exaggeration to say that, in a certain sense, we artificially turned a part of our population into alcoholics so that, then, by lowering the level of social claims of these people, we could drive them to low-status jobs.” In one telling historical analogy, Yaremenko lamented that “we created a colony from our own people” (44–45). Or in another, he figured the terminal stage as a war economy: “We could develop further only by consuming ourselves” (150).

### **Conclusion: Structural Rebalancing versus Microeconomic Reform**

Yaremenko’s theory shaped his understanding of the reforms the Soviet Union needed and his assessment of those it ultimately underwent. He saw the judgment of the country’s leadership and its policy thinkers distorted by a failure to come to terms with the insupportable burden of military competition. Repressing this knowledge, they invested ever more hope in specific proposals that might enable a sudden leap to catch up with—and overtake—the West, the claims for which grew from exaggeration into

fiction and thence into “schizophrenia.” Yaremenko (1998, 68–69, 71–75) labeled this pattern “technocratic,” after the euphoria surrounding the technological feats of the 1950s and 1960s.

To Yaremenko, the search for a panacea in economic reform was a variation on this technocratic delusion. One example, on the border of the technological and the economic, was the push for automated control systems and the computerization of management, the apotheosis of which was Academician Glushkov’s dream of the nationwide computer network “a completely schizophrenic idea” (73).<sup>18</sup> But Yaremenko understood similarly the schemes of crypto-market socialists and optimal planners during the 1960s and again during perestroika to “improve the economic mechanism” by introducing quasi-markets to decentralize planning (82, 98). This was to enable a return to growth without creating political losers. To Yaremenko both remained “technocratic” because they evaded the structural imbalances of the economy and their institutional—in the last instance, political—drivers.

Yaremenko’s own reform plans were, accordingly, macrostructural, but their final target was the social, even spiritual, welfare of the people (93–98). He proposed a halt and then retrenchment of military spending, shifting investment to the civilian sphere. The conversion of military high-technology industries to civilian production would, over ten to fifteen years, provide the substitution flows necessary for intensive development. In the meantime, civilian investment could saturate the demand for durable consumer goods and housing. Macroeconomically, this would absorb the forced savings that Soviet households had accumulated. Politically, it would also pay off the “social debt” incurred to the population by the state-imposed system of privilege and preference (143–44). And—let us call this “spiritually”—by providing households with access to goods, it would restore labor incentives, and prevent the degradation of the workforce into hopelessness and alcoholism.<sup>19</sup>

His scenario was conditional on the will and power to implement it, which returns us to the administrative monsters. Even in hindsight, Yaremenko found that “the logic of disintegration was, in a sense, unstoppable. The growing shortages and the related tensions in the economy paralyzed the remnants of constructive thinking” (98).

18. For the history of Victor Glushkov’s computer networking plans, see Peters 2016.

19. Yaremenko’s writings on economic reform are collected in Yaremenko 1999. Khanin 2008 and 2009 analyze them in the context of other perestroika-era reform thinking.

## References

- Anchishkin, Aleksandr I., and Emil B. Ershov. 1966. *Printsipy narodnokhoziaistvennogo prognozirovaniia*. NIEI pri Gosplane SSSR.
- . 1967. “Metodologicheskie voprosy narodnokhoziaistvennogo prognozirovaniia.” *Voprosy ekonomiki*, no. 5: 52–64.
- Anchishkin, Aleksandr I., and Yurii V. Yaremenko, eds. 1967. *Tempy i proporsii ekonomicheskogo razvitiia*. Moscow: Ekonomika.
- Baranov, Eduard F., Stanislav S. Shatalin, Feliks N. Klotsvog, Vladimir V. Kossov, and Moisei R. Eidelman. 1967. “Itogi i perspektivy mezhotraslevykh issledovaniy v SSSR.” *Ekonomika i matematicheskie metody* 3 (5): 683–96.
- Belykh, Andrei A. 2007. *Istoriia rossiiskikh matematiko-ekonomicheskikh issledovaniy: Pervye sto let*. 2nd ed. Moscow: Izdatel'stvo LKI.
- Boldyrev, Ivan, and Olessia Kirtchik. 2017. “The Cultures of Mathematical Economics in the Postwar Soviet Union: More than a Method, Less than a Discipline.” *Studies in History and Philosophy of Science Part A* 63:1–10.
- Cooper, Julian. 1973. “The Concept of the Scientific and Technical Revolution in Soviet Theory.” *CREES Discussion Papers*, no. 9. University of Birmingham.
- . 1977. “The Scientific and Technical Revolution in Soviet Theory.” In *Technology and Communist Culture: The Socio-Cultural Impact of Technology under Socialism*, edited by Frederic J. Fleron. New York: Praeger.
- . 1979. “The Scientific and Technical Revolution in the USSR.” *Co-Existence* 18 (2): 175–92.
- Ershov, Emil B. 2013. “Uchenyi-grazhdanin i obshchestvo: Priznanie pri chastichnom ponimaniy ego obshchestvenno znachimykh idei i tseli.” In *Ocherki o zhizni i nauchnoi deyatel'nosti A.I. Anchishkina*, edited by Pol' V. Savchenko, 135–45. Moscow: INFRA-M.
- . 2008. “Razvitie i realizatsiia idei modeli mezhotraslevykh vzaimodeistviy dlia Rossiiskoi ekonomiki.” *Ekonomicheskii zhurnal Vysshei Shkoly Ekonomiki* 12 (1): 3–28.
- Fal'tsman, Vladimir K. 2007. *Uchenie v kontekste vremeni*. Moscow: Progress.
- Fedorenko, Nikolai Prokofevich. 1999. *Vspominaia proshloe, zagladivaiu v budushchee*. Moscow: Nauka.
- Fel'dman, G. A. 1928a. “K teorii tempov narodnogo dokhoda (pod uglom zreniia narodnogo khoziaistvo SSSR).” *Planovoe khoziaistvo* 10 (11): 146–70.
- . 1928b. “K teorii tempov narodnogo dokhoda (okonchanie).” *Planovoe khoziaistvo* 10 (12): 151–78.
- Feygin, Yakov. 2017. *Reforming the Cold War State: Economic Thought, Internationalization, and the Politics of Soviet Reform, 1955–1985*. PhD diss., University of Pennsylvania.
- Guth, Stefan. 2015. “One Future Only: The Soviet Union in the Age of the Scientific-Technical Revolution.” *Journal of Modern European History* 13 (3): 355–76.
- Josephson, Paul R. 1981. “Science and Ideology in the Soviet Union: The Transformation of Science into a Direct Productive Force.” *Soviet Union/Union Sovietique* 8 (2): 159–85.

- Katsenelinboigen, Aron. 1980. *Soviet Economic Thought and Political Power in the U.S.S.R.* New York: Pergamon.
- Khanin, Grigori I. 2008. "Ekonomicheskie diskussi kontsa perestroiki." *EKO*, no. 12, 39–55.
- . 2009. "Ekonomicheskie diskussi kontsa perestroiki (Okonchanie)." *EKO*, no. 2, 85–103.
- Klepach, Andrei, and Gennady Kuranov. 2014. "The Development of Socioeconomic Forecasting and the Ideas of Aleksandr Anchishkin." *Social Sciences* 45 (2): 3–14.
- Kornai, János. 1980. *Economics of Shortage*. Amsterdam: North-Holland.
- Kosygin, Aleksei N. 1965. "Povyshenie nauchnoi obosnovannosti planov—Vazhneishaiia zadacha planovykh organov (vystuplenie na zasedanii Gosplana SSSR)." *Planovoe khoziaistvo* 42 (4): 3–10.
- Kossov, Vladimir V. 2014. "Vozrozhdenie mezhotraslevogo balansa v SSSR." *Ekonomicheskaiia nauka sovremennoi Rossii* 65:103–10.
- Leeds, Adam E. 2016. "Dreams in Cybernetic Fugue: Cold War Technoscience, the Intelligentsia, and the Birth of Soviet Mathematical Economics." *Historical Studies in the Natural Sciences* 46 (5): 633–68.
- Metody narodnokhoziaistvennogo prognozirovaniia*. 1985. Moscow: Nauka.
- Modelirovaniie mezhotraslevykh vzaimodeistvii*. 1984. Moscow: Nauka.
- Peters, Benjamin. 2016. *The Soviet Internet: How Not to Network a Nation*. Cambridge, Mass.: MIT Press.
- Predstavlenie i obsuzhdenie knigi Yu. V. Yaremenko, Teoriia i metodologiia issledovaniia mnogourovnevoi ekonomiki*. 1998. Moscow: Izdatel'stvo instituta narodnokhoziaistvennogo prognozirovaniia. [ecfor.ru/wp-content/uploads/history/yaremenko.pdf](http://ecfor.ru/wp-content/uploads/history/yaremenko.pdf).
- Rindzevičiūtė, Eglė. 2015. "Toward a Joint Future beyond the Iron Curtain: East–West Politics of Global Modelling." In *The Struggle for the Long Term in Transnational Science and Politics: Forging the Future*, edited by Eglė Rindzevičiūtė and Jenny Anderson, 115–43. London: Routledge.
- . 2016a. "A Struggle for the Soviet Future: The Birth of Scientific Forecasting in the Soviet Union." *Slavic Review* 75 (1): 52–76.
- . 2016b. *The Power of Systems: How Policy Sciences Opened Up the Cold War World*. Ithaca, N.Y.: Cornell University Press.
- Rocca, Gordon L. 1981. "'A Second Party in Our Midst': The History of the Soviet Scientific Forecasting Association." *Social Studies of Science* 11:199–247.
- Savchenko, Pol' V., ed. 2013. *Ocherki o zhizni i nauchnoi deyatel'nosti A.I. Anchishkina*. Moscow: INFRA-M.
- Shukhov, Nikolai S., and Mikhail P. Freidlin. 1996. *Matematicheskaiia ekonomiiia v Rossii (1885–1995)*. Moscow: Nauka.
- Strizhkova, Liubov. 2011. "Mezhotraslevye issledovaniia v GU IMEU." In *Mezhotraslevoi balans—Istoriia i perspektivy*, 87–95. Moscow: Gosudarstvennoe uchrezhdenie Institut makroekonomicheskikh issledovaniia.
- Sutela, Pekka. 1984. *Socialism, Planning, and Optimality: A Study in Soviet Economic Thought*. Helsinki: Finnish Society of Sciences and Letters.



- Tremblay, Vladimir G. 1967. "Input-Output Analysis and Soviet Planning." In *Mathematics and Computers in Soviet Economic Planning*, edited by John P. Hardt, Marvin Hoffenberg, Nathan Kaplan, and Herbert S. Levine, 68–120. New Haven, Conn.: Yale University Press.
- Tretyakova, Albina, and Igor Birman. 1976. "Input-Output Analysis in the USSR." *Soviet Studies* 28 (2): 157–86.
- Yaremenko, Yurii V. 1968. "*Bolshoi Skachok*" i narodnye kommuny v Kitae. Moscow: Izdatel'stvo politicheskoi literatury.
- . 1977. *Analiz i prognozirovanie mezhotrasloi struktury narodnogo khoziaistva: Avtoreferat dissertatsii na soiskanie uchenoi stepeni doktora ekonomicheskikh nauk*. Moscow: CEMI AN SSSR.
- . 1981. *Strukturnye izmeneniia v sotsialisticheskoi ekonomike*. Moscow: Mysl'.
- . 1997. *Prognozy razvitiia narodnogo khoziaistva i varianty ekonomicheskoi politiki*. Moscow: Nauka.
- . 1998. *Ekonomicheskie besedy: Dialogi Belanovskim*. Moscow: Tsentr issledovaniia i statistiki.
- . 1999. *Prioritety strukturoi politiki i opyt reform*. Moscow: Nauka.
- . 2000. *Teoriia i metodologiia issledovaniia mnogourovnevnoi ekonomiki*. Moscow: Nauka.
- Yaremenko, Yurii V., Emil B. Ershov, and Anatolii S. Smyshlyaev. 1975. "Model' mezhotraslevykh vzaimodeistvii." *Ekonomika i matematicheskie metody* 11 (3): 421–38.
- . 1980. *A Model of Interindustry Interaction in the USSR*. International Institute for Applied Systems Analysis Collaborative Papers 80-40.
- Yaremenko, Yurii V., N. A. Lavrenov, and V. S. Sutiagin. (1974) 1975. "Calculation and Analysis of Interindustry Proportions in the National Economy of the USSR." *Matekon* 11 (4): 40–56.
- Zauberman, Alfred. 1975. *The Mathematical Revolution in Soviet Planning*. New York: Oxford University Press.
- . 1976. *Mathematical Theory in Soviet Planning: Concepts, Methods, Techniques*. New York: Oxford University Press.