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# The central planning model of the Soviet Union of 1950-1970s: how it really functioned

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## Abstract

Overall the record of the Soviet Union in maintaining economic growth and high level of welfare indicators is quite spectacular, especially until the mid-1960s. The major strength of the CPE in the 1950-70s came from its ability to mobilize savings and to turn them into investment. After the Second World War the “big push” (industrialization) of the 1930s started to pay off – massive retirement of fixed capital stock has not yet started, so new investment could have been used to alleviate inherent supply bottlenecks.

The 1950-70s is the period when the drawbacks of the CPE (economic calculation problem) started to outweigh the advantages (ability to mobilize savings for investment). Centrally planned economy (CPE) is sometimes characterized as an antonym of a market economy, but this is not true. The ability of the central planning authority to develop and implement a coherent balanced plan for the national economy (not even to speak about the optimal plan) is limited and hence the vacuum is being filled with the automatic mechanisms of self-regulation that are in essence similar to the market adjustment process, but less efficient.

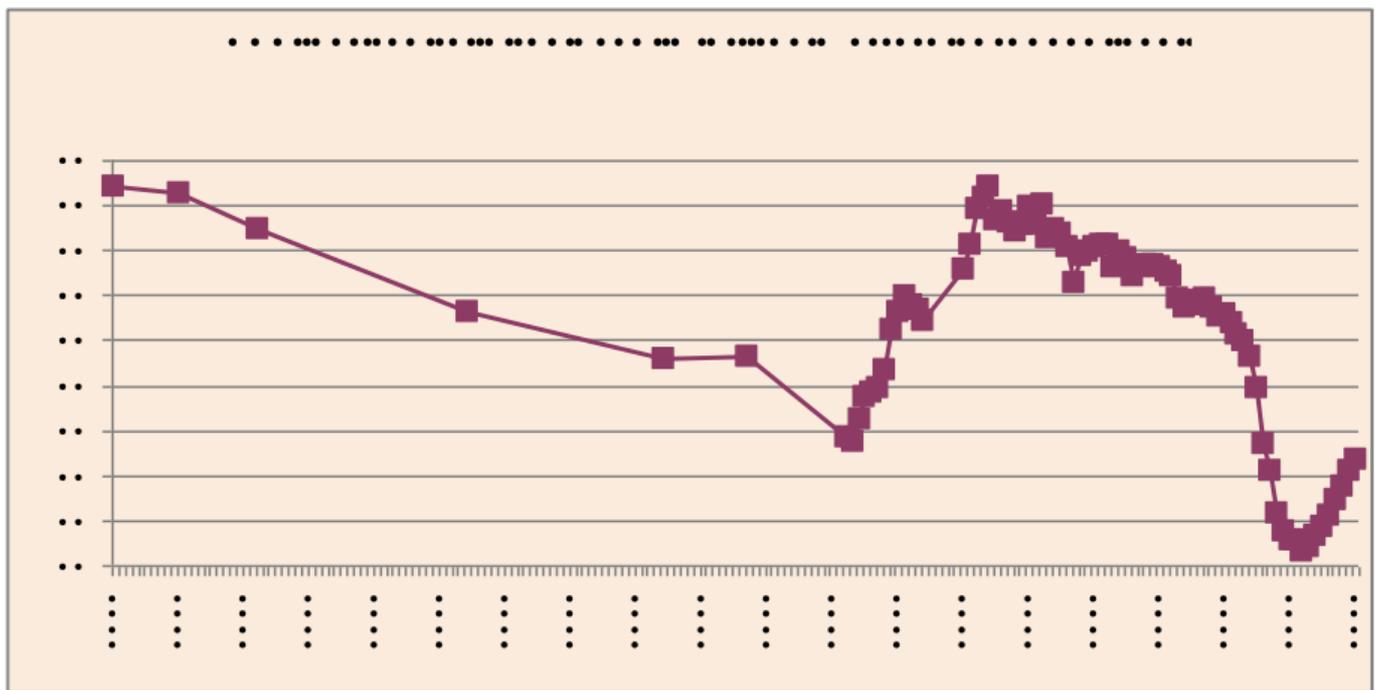
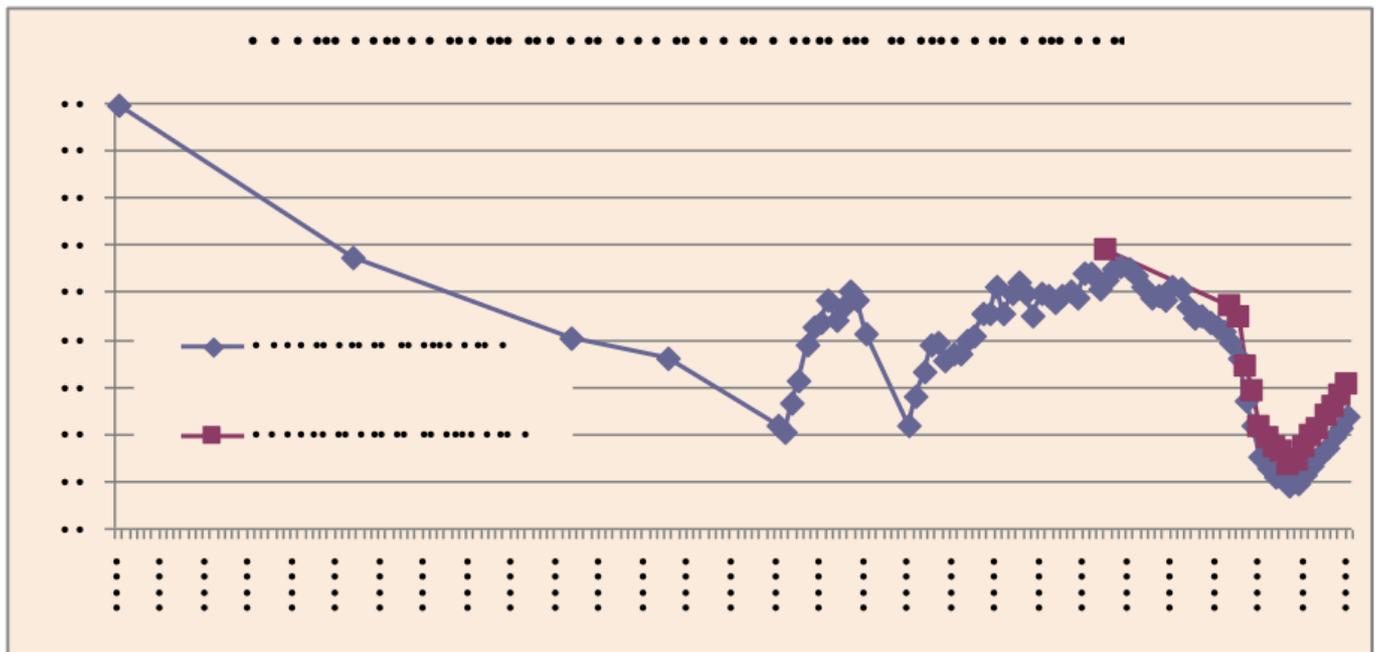
This paper argues that the planners influenced the development of the national economies not so much via adopting the planned targets, but by choosing the priority investment projects. The financing of these projects gave impulses to the other industries via multiplier process that triggered either price increases or output increases, depending on the gap between the potential and actual output, very much like in a market economy.

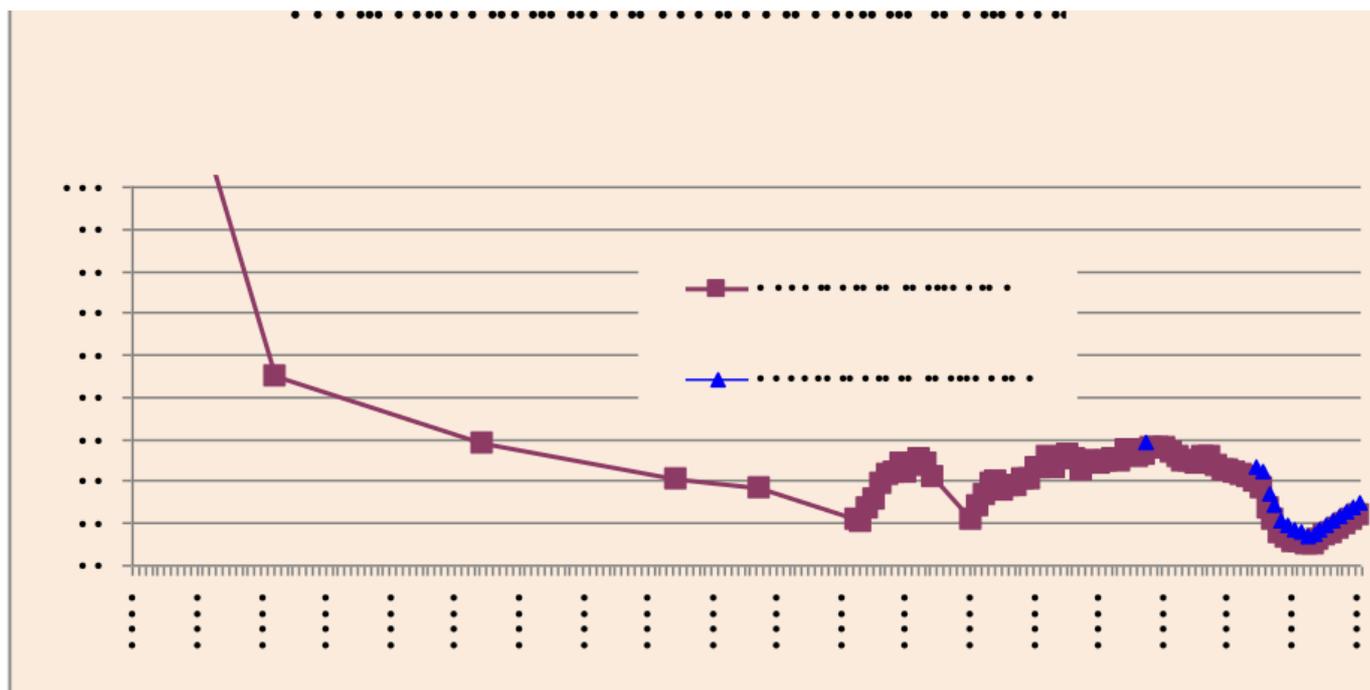
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The 1950s-70s – the golden age of Soviet economic model. In fact, from the 1920s to 1960s, the USSR and Japan were the only two major developing countries that successfully, if only partially, bridged the gap with the West, especially in the 1950s-60s (fig. 1). Russia was permanently falling behind the West in the 16-19<sup>th</sup> century – neither reforms of Peter the Great in the early 18<sup>th</sup> century, nor the elimination of serfdom in 1861 (Emancipation Act), nor Witte’s and Stolypin’s

reforms in the early 20<sup>th</sup> century could have changed the trend. Only in the 1920s-60s Russia (USSR), for the first time in its history, started to catch up with the West (fig. 1).

Despite popular beliefs that Soviet economic development was a failure, the USSR in 1928-70 was the second fastest growing country in world after Japan (Allen, 2003, fig. 1.1, p.7) and in the 1950s it was growing as fast as Asian tigers. Many developing countries all over the world were trying to copy the Soviet model in the 1950s-60s, even though Soviet assistance at that time was minimal and in any case way below Western assistance. The Soviet model at a time was probably no less attractive for the developing world than the Chinese economic model today.

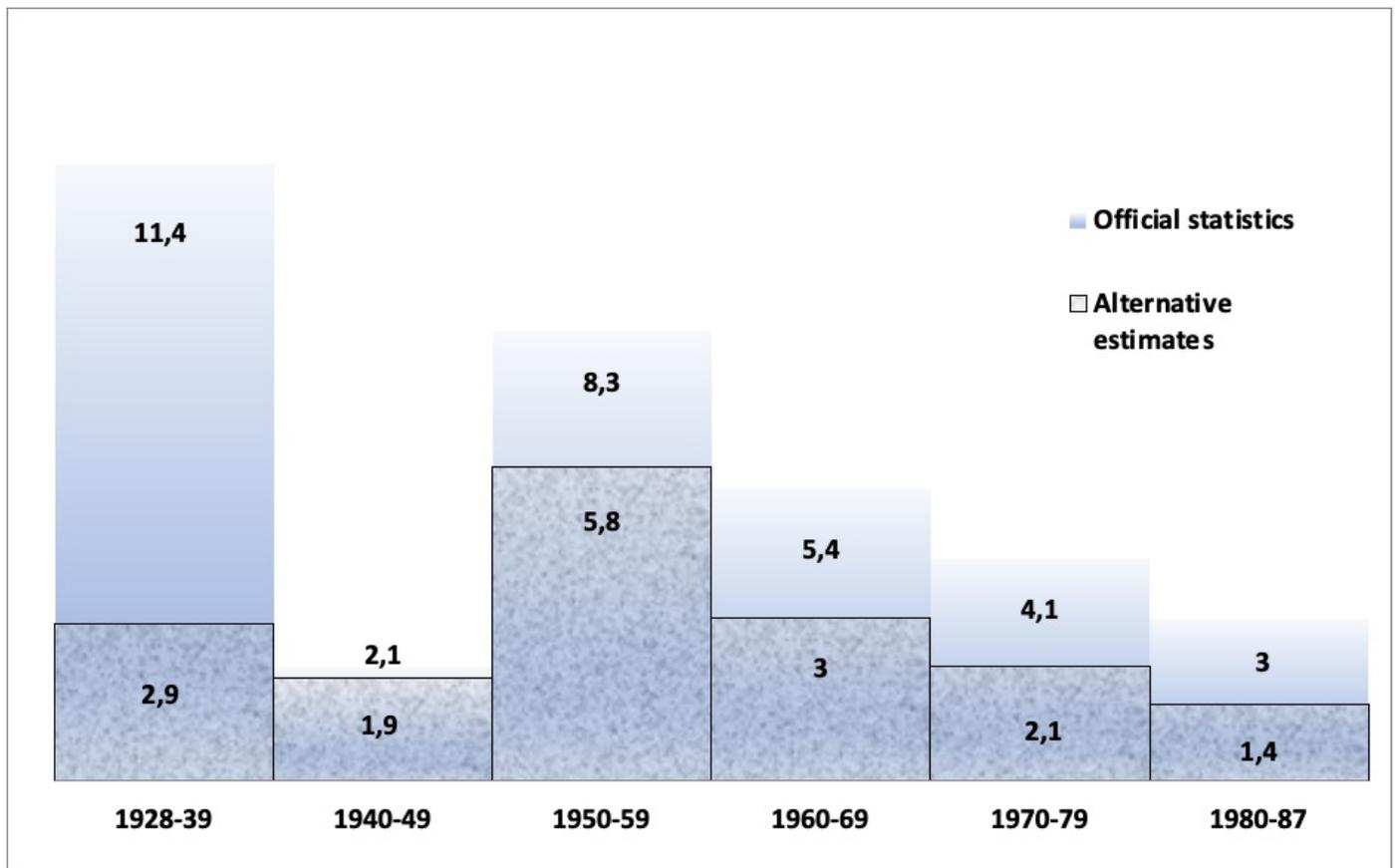




**Figure 1.** PPP GDP per capita in the USSR and Russia, % of Western European and US level

Source: Maddison, 2010.

1950s-60s period was exceptionally successful, more successful than the 1930s, even though the success of 1950s-60s was based on the foundation of the industrialization of the 1930s. The growth rates of labour productivity in the 1930s, the period of dramatic structural shifts, were high (3% a year), but not exceptional, whereas the highest growth rates were observed in the 1950s (6 %) – fig. 2. The TFP growth rates over decades increased from 0.6 percent annually in the 1930s to 2.8 percent in the 1950s and then fell monotonously becoming negative in the 1980s (table 1). The decade of the 1950s was thus the “golden period” of Soviet economic growth (fig. 2). The patterns of Soviet growth of the 1950s in terms of growth accounting were very similar to the Japanese growth of the 1950s-70s and Korean and Taiwanese growth in the 1960-80s—fast increases in labour productivity counterweighted the decline in capital productivity, so that the TFP increased markedly (table 1).



**Figure 2.** Annual average productivity growth rates in Soviet economy, %

Source: Easterly, Fisher, 1995.

In 1957 the Soviet Union was the first country to launch the satellite (sputnik) into orbit, in 1961 Yuri Gagarin became the first man in space, in the mid-1960s Soviet life expectancy reached 70 years – huge social achievement given that in the United States that had 4 to 5 times higher personal income it was only 1.5 years higher.

**Table 1.** Growth in the and Asian economies, Western data, 1928-87 (average annual percent)

Period/ country	Output per worker	Capital per worker	Capital/ output ratio	TPF growth (unit elasticity of substitution)	TPF growth assuming 0.4 elasticity of substitution
(1928-39)	2.9	5.7	2.8	0.6	
(1940-49)	1.9	1.5	-0.4	1.3	
(1950-59)	5.8	7.4	1.6	2.8	1.1
(1960-69)	3.0	5.4	2.4	0.8	1.1
(1970-79)	2.1	5.0	2.9	0.1	1.2
(1980-87)	1.4	4.0	2.6	-0.2	1.1
(1950/57/65/-85/88/90)			2.3 - 3.2	1.7 - 2.5	
(1950/60/65-85/88/90)			2.8 – 3.7	1.7 - 2.8	
(1950/53/65-85/88/90)			2.6 – 3.1	1.9-2.4	

Source: Easterly, Fisher, 1995.

“Red Plenty”, a novel by Francis Spufford, nicely captures the atmosphere of that time – the belief that the gap between the USSR and the West is closing down and will disappear soon because socialism is not only a more advanced social system, but also a more competitive economy. During the famous “kitchen debate” of 1959 Soviet leader Nikita Khrushchev famously refused to admit that capitalism can have better innovations at least in some areas. Richard Nixon, the US vice president, opening an American exhibition in Moscow, offered a diplomatic formula – you are ahead in space, we are ahead in coloured TV, let us compete for the benefit of consumers in both countries. Khrushchev, as soon as Nixon’s words were translated to him, raised his hand up in objection: we surpassed you in rockets, we’ll surpass you in TV, he said (Khrushchev and Nixon, 1959). Not only in the Soviet Union, but in the world, many people at that time sincerely believed that this is exactly what is going to happen. That was the spirit of the time in the period when the Soviet system was retaining its dynamism and catching up with the West.

In the second half of the 20<sup>th</sup> century, however, the Soviet Union experienced the most dramatic shift in economic growth patterns. High post-war growth rates of the 1950s gave way to the slowdown of growth in the 1960s-1980s and later – to the unprecedented depression of the 1990s associated with the transition from centrally planned economy (CPE) to a market one. Productivity growth rates (output per worker, Western data) fell from an exceptionally high 6% a year in the 1950s to 3% in the 1960s, 2% in the 1970s and 1% in the 1980s (fig. 2). In 1989 transformational recession started and continued for almost a decade: output was constantly falling until 1999 with the exception of one single year – 1997, when GDP increased by barely noticeable 0.8%. If viewed as an inevitable and logical result of the Soviet growth model, this transformational recession worsens substantially the general record of Soviet economic growth.

## Theory and practice of central planning

As early theoreticians of socialism believed, a centrally planned economy organized rationally – the whole society working as one single plant – should be able to avoid these losses and thus to achieve higher efficiency. “In the last analysis, – wrote Lenin in 1919, – productivity of labor is the most important, the principal thing for the victory of the new social system. Capitalism created a productivity of labor unknown under serfdom. Capitalism can be utterly vanquished, and will be utterly vanquished, by the fact that socialism creates a new and much higher productivity of labor” (Lenin, 1919, p. 231). And initially it seemed like the prophecy was coming true – the USSR was doing better than any other developing country in terms of catching up with the West.

Socialist thinkers – from Thomas Moore and Tommaso Campanella to Saint-Simon, Fourier and Owen to Marx, Engels and Lenin – were dreaming about more rational and just society not without a reason. The deficiencies of the capitalist market were obvious and numerous. Equilibrium in the market economy is achieved only through deviations from equilibrium. All kind of supply and demand shocks in different markets push the economy out of equilibrium. There is permanent unemployment and there are unloaded production capacities. There is a business cycle – periodically, once in 5 to 10 years, capitalist economy gets into a recession, i.e. experiences contraction of output that lasts 1 to 2 years. Markets fail in many instances – in providing public goods, in adequately regulating externalities, in selecting projects with long term time horizon (like fundamental research, development of new territories and/or industries).

There is hardly any social justice – when prices fall due to overproduction, even most diligent and efficient producers cannot recover their costs, whereas when prices rise due to shocks (for instance, increase in demand for national flags after 9/11), producers get windfall profits. There are bubbles and huge volatility in stock and real estate prices, resource prices and exchange rates. “Irrational exuberance” – an expression used by Federal Reserve Chairman Alan Greenspan – is not an exaggeration or a temporary and limited in space phenomenon, it is rather an essential, permanent and pervasive characteristic of many markets, from stock market to commodities markets. It is impossible to explain rationally how prices of oil, for instance, go from \$13 (1998) to over \$100 (2008) in a matter of several years in the absence of major change in fundamentals. The human being, the crown of creation, whose mental abilities are second to none, is being reduced to being an instrument of the market forces; her destiny and wellbeing are determined by the merciless and often irrational mechanics of the markets that she neither understands, nor controls.

But there are also deficiencies of the CPE associated with the practical impossibility to establish billions of industrial proportions (to balance supply and demand for millions of goods and services) from the center, especially in a dynamic economy with unpredictable technical progress and innovations.

Even with the use of input-output models and most powerful computers it was actually possible to develop a reasonable balanced plan for less than 1% of products (at the very best), for which the planners actually established production quotas in physical units.

The theory of central planning was based on general equilibrium models (Leon Walras, Gerard Debreu, Kenneth Arrow) and input-output models (Wassily Leontief). Leonid Kantorovich, the only Soviet economist that won the Nobel Prize (in 1975 together with an American Tjalling Koopmans), published in 1959 “*The Best Use of Economic Resources*”

(Kantorovich, 1959), proving mathematically that not only equilibrium, but also equilibrium at the optimal level is theoretically possible in a static CPE.

The simplified basic equation of the input-output model describes the distribution of output of each particular product:

$$x_i = \sum_{j=1}^n a_{ij}x_j + y_i + E_i - I_i + S_i$$

where  $x_i$ ,  $y_i$ ,  $E_i$ ,  $I_i$ ,  $S_i$  - volumes of production, final consumption, export, import and change in stocks of  $i$ -product respectively,

$a_{ij}$  - input-output coefficients, i.e. inputs of  $i$ -product per unit of  $j$ -product output.

Output of the product  $i$  (for instance coal) is equal to the intermediate consumption, i.e. consumption for production purposes) plus final consumption by households, plus net exports (exports minus imports), plus change in stocks. Intermediate consumption in turn is equal to the multiple of technological coefficients and volumes of output of other products – coal consumption, to continue the example, is equal to the expenditure of coal for the production of one kilowatt of electrical energy multiplied by the total number of kilowatts produced, plus the expenditure of coal for the productions of one ton of steel multiplied by the total number of tons of steel produced, and so forth.

If  $n$  is the number of products, there is  $n$  equations with  $2n$  unknowns ( $x_i$  and  $y_i$  – volumes of output of every single product and final consumption of these products respectively). The system becomes solvable, if the structure of consumption is fixed and the total consumption is maximized:

$$F = ay_1 + by_2 + \dots + wy_n \Rightarrow \max$$

where  $a$ ,  $b$ , ...  $w$  - parameters, fixing the structure of final consumption.

Even more so, in theory this optimal equilibrium could be attained through setting prices for inputs and outputs (“objectively determined valuations” – shadow prices), not through setting production quotas in physical units (so called “dual problem” of production planning). It was shown that there is one and only one set of prices that possesses the magic property – when these prices are assigned to products and producers are instructed to maximize profits, they are inevitably choosing exactly the optimal plan that was previously computed by the planners. The hope was that with greater capacity of computers and better techniques to manage unforeseen technological developments the computation of the optimal plan would become feasible.

In practice, however, there were too many products and the costs of gathering all the necessary information on technological coefficients were prohibitive. Worse, there were unobservable variables, e.g. technological coefficients for new products and technologies, parameters of the changing demand function. Even if the information gathering and processing problem were resolved, if all technological coefficients (expenditure of  $i$ -input for the production of  $j$ -good) were precisely calculated and infinite size matrix could be easily inverted by super powerful computers, the dynamic problem still persisted.

Technological coefficients tend to change and new products tend to emerge not according to a plan, but spontaneously, due to technical progress that is not predictable by definition. This was exactly the argument of Ludwig von Mises (1920) in his article "Economic Calculation in the Socialist Commonwealth". It was later developed by Friedrich Hayek (1944) in "The Road to Serfdom" – he argued that the planners will never have enough information to carry out reasonable allocation of resources. In his lecture "Competition as a Discovery Procedure" he argued that outcomes of competition are "unpredictable and on the whole different from those that anyone would have been able to consciously strive for" (Hayek, 1968, p. 10).

As a result, the attempt to establish billions of industrial proportions (to balance supply and demand for millions of goods and services for every year and month) from the center, especially in a dynamic economy with unpredictable technical progress and innovations, resulted in numerous deficiencies. Even with the use of input-output models and most powerful computers it was actually possible to develop a reasonable balanced plan for less than 1% of products (at the very best), for which the planners actually established production quotas in physical units.

To add insult to injury, in the XX century there were no powerful computers and no information on all technological coefficients for millions of goods, so the real planning process looked totally different from theory. In the USSR, input-output models were developed only for several hundred aggregated positions (only starting from the 1960s) and used only in the pre-planning calculations. The actual planning was carried out through so called material balances – supply and demand estimates for particular goods (production + imports = intermediate consumption + final consumption + exports + increase in stocks). *Gosplan* (State Planning Committee) was responsible for material balances for about 2,000 aggregated product groups, *Gossnab* (State Supply Committee) disaggregated these into about 15,000 positions, industrial branch ministries – into about 50,000 positions. Finally, each product position was sub-divided into 10-15 specific products at a stage of linking suppliers and users of these particular products. So altogether about 0.5-0.75 million items were planned, whereas 25 million varieties of goods were actually produced (not counting services).

Whenever material balances did not add up, the bargaining process started between *Gosplan*, *Gossnab*, branch-industry ministries and enterprises ("could you increase the supply?", "could you limit the demand?"), and whenever the iteration process of multi-phased negotiations was still not allowing to make the ends meet, shortages of supplies were supposed to be eliminated through new investment (expansion of existing and construction of new production capacities) and imports. Finally, the enterprises were asked to make delivery contracts with one another, and after these contracts were approved by the planners, they received a status of the adopted plan that was made into law by the supreme legislative bodies.

### **Pluses and minuses of central planning**

The CPE could have eliminated some deficiencies and losses of the market, but created new losses resulting from the inability to balance myriads of economic proportions without the market self-adjustment mechanism. The biggest advantage of CPE was its ability to mobilize savings and to turn them into investment, which led to the acceleration of economic growth. As noted above, in the 1950s the Soviet economic growth in terms of productivity and total factor

productivity increases resembled that of the Asian tigers. But in the 1960s the economy started to slow down and by the end of the 1980s productivity growth virtually came to an end.

Where have all Soviet competitiveness gone? It is important to separate the inherent deficiencies of CPE from the numerous problems resulting from “bad implementation” and caused by specific historical circumstances. Import substitution industrial policy (instead of export promotion in China), deterioration of the institutional quality (bureaucratization and increase in corruption), macroeconomic policy mistakes and other factors, all played a role, but were not unavoidable. With better decision makers (like in other countries, China, for instance) these problems could have been avoided. But what really became the insurmountable and binding growth constraint in the 1970s-80s in the Soviet Union was the absence of the automatic (self-adjusting) market mechanism in the period of “aging” of the CPE – aging of the fixed capital stock and the inability of the CPE to replace the retiring machinery and equipment, buildings and structures without aggravating shortages and lowering capacity utilization rate. As argued in Popov (2007), the CPEs under-invested into the replacement of the retiring elements of the fixed capital stock and over-invested into the expansion of production capacities. China after 20 years of central planning (late 1950s-1979) made a transition to the market and avoided the CPE aging problem.

Shortages were inevitable in CPE almost by definition. And capital investment was regarded as a major tool of eliminating the bottlenecks resulting from shortages. So capital investment was diverted to create new production capacities that would have allowed expanding production of scarce goods. The whole planning procedure looked like an endless chain of the urgent decisions forced by emergency shortages of different goods that appeared faster than the planners were able to eliminate them.

This was a sort of a vicious circle, a permanent race against time, in which decisions to make capital investment were predetermined by existing and newly emerging shortages. It turned out, therefore, that any attempts to cut the investment in new plant and equipment led to increased distortions and bottlenecks, resulting, among other things, in the lower capacity utilization rate, while the increased investment in the construction of new production facilities contributed to the wear and tear of fixed capital stock and to the widening of the gap between job vacancies and the limited supply of the labor force, also causing the decline in the capacity utilization. Under central planning, unfortunately, there was no third option.

It was more or less possible to fight shortages in the CPE in the first 20-30 years after the “big push” when all available savings could have been used for eliminating constantly emerging bottlenecks, but after this period, when part of the savings had to be used to renovate the aging fixed capital stock, the remaining part was just not enough to deal with the bottlenecks. The choice was either not to renovate and to use all savings for shortages-eliminating investment, or to renovate at a price of aggravating shortages. Needless to say, both options were bad, leading to declining capital productivity.

Not surprisingly, after the massive investment of the 1930s in the USSR, the highest productivity was achieved after the period equal to the service life of capital stock (about 20-30 years) – before there emerged a need for the massive investment into replacing retirement. Afterwards, the capital stock started to age rapidly reducing sharply capital

productivity and lowering labour productivity and TFP growth rates.

Among many reasons of the decline of the growth rates in the USSR in the 1960s-1980s, the inability of the CPE to ensure adequate flow of investment into the replacement of retirement of fixed capital stock appears to be most crucial one. What is more important, even if these retirement constraints were not the only reason of the decline in growth rates, they are sufficient to explain the inevitable gradual decline after 30 years of relatively successful development. This way or the other, after the massive investment of the 1930s in the USSR (the “big push”), the highest productivity was achieved after the period equal to the service life of capital stock (about twenty years) before there emerged a need for massive investment into replacing retired stock. Afterwards, capital stock started to age rapidly, sharply reducing capital productivity and lowering labor productivity and the TFP growth rate.

If this explanation is correct, a CPE is doomed to experience a growth slowdown after three decades of high growth following a “big push”. The relatively short Chinese experience with the CPE (1949/59-79) looks superior to the East European experience (1950-1991) and excessively long Soviet experience (1929-91). It was only the USSR that fully experienced all the negative consequences of aging of the CPE. This is one of the reasons to believe that transition to the market economy in the Soviet Union would have been more successful if it had started in the 1960s.

Was it possible – the transition to a market economy in the USSR in the 1960s? Most probably, yes. It was a junction that happens in a development process from time to time, when the outcome – the route to take for the next several decades, if not centuries, – is determined not so much by historical necessity, but by the confluence of circumstances, by the interplay of minor events that could produce different trajectories. If this transition to the market would have been carefully managed, the outcome probably could have resembled more a Chinese pattern of market type reforms of the 1979 and beyond – without major transformational recession, without dramatic weakening of state institutions and virtual privatization of the state, without skyrocketing growth of shadow economy, crime, suicides and mortality.

But, there were reasons why the transition to the market in the USSR in the 1960s could have been less successful than the Chinese. Socialism contributed to the restoration of the collectivist institutions in both countries, Russia and in China: income inequalities decreased and institutional capacity of the state improved. But the legacy of 300 years of Westernization in Russia kicked back once market reforms were carried out in the 1990s, after 70 years of socialism: inequalities increased greatly, as did corruption, crime, and shadow economy. What could have been repaired in China in 30 years of socialism, could not have been fixed in Russia even after under 70 of socialism and 60 years of central planning (since 1929), not to speak about 30 years (Popov, 2014).

Russia could have returned to the pre-1917 trajectory of adopting the Western institutions with high income inequalities and polarization of the society (pretty much like it did in the 1990s). Transformational recessions could have been shorter and not so deep, but the weakening of the institutions – increase in crime and shadow economy – would be pretty much inevitable (Popov, 2009; 2014a).

In reality though, there was no transition to the market in the 1960s, so in the absence of rotation and control from below over managerial cadres and the inability of the CPE to renovate capital stock, bureaucratization of apparatus and aging of

equipment and structures led to the growth slowdown. *Sovnarkhozy* reform (1957-65) designed to renovate cadres and officials, and *khozraschet* reforms (1965) designed to stimulate innovations and growth basically failed. Since the mid-1960s there started a decline of the CPE in the USSR. Growth of GDP per capita in the USSR continued in the 1970s and 1980s, but the rates of growth were slowing down, so that the income gap with the West stopped closing and then started to widen. Life expectancy after reaching 70 years in 1965 stopped growing, crimes, murders, suicides started to increase.

To conclude, overall the record of the Soviet regime in maintaining economic growth and high level of welfare indicators is quite spectacular, especially until the late 1960s. Since the mid-1960s, however, growth started to slow down, whereas social evils – mortality, crime, murders, suicides, alcohol consumption – started to increase. In political and social life Khrushchev thaw came to an end by mid 1960s (Khrushchev was removed from power in 1964), and the hopes of transforming the Soviet regime into “socialism with human face” were buried in 1968, when the Soviet troops were moved into Czechoslovakia. The primary reason for the slowdown of growth was the inability of the CPE to replace the retiring fixed capital stock without aggravating shortages. When in the 1960s, 30 years after the “big push”, time finally came to make such investment, the economy started to slow down.

In contrast, Chinese model probably retained the possibility to transform itself into market socialism with limited private property of the means of production and low income inequalities. But inequalities started to rise in China after 1985 (after the industrial reform was launched in 1983), “growing out of socialism” – creation of private enterprises from scratch – made private property predominant in the late 1990s, effectively transforming China into the capitalist society.

The great socialist experiment of the XX century thus came to an end with only Cuba and North Korea stepping into the XXI century as socialist countries. But as the old top down socialism of the XX century is dying out, the new grass root socialism may be growing from below.

### **How the CPE really functioned**

The centrally planned economy (CPE) in the USSR, Eastern Europe and China disappeared before the economists were able to figure out how it works. Among many unresolved puzzles is the change in the growth rates over time: it was pretty obvious that actual growth rates deviate significantly from the planned targets, but there was no good explanation of why they vary from year to year.

Wassily Leontief, the Nobel prize winner in economics, once noted that an economy using the profit motive but without planning is like a ship with a sail but no rudder. It may move rapidly, but cannot be steered and might crash into the next rock. A purely planned economy that has eliminated the profit motive is like a ship with a rudder but no sail. It could be steered exactly where one wants it to go, if only it moved (Leontief, 1974).

It may well be that this comparison is not doing justice to the CPE in one respect – it could not be steered exactly where the planners want it to go. And why the actual growth rates deviated from the planned targets – sometimes more and sometimes less – still remains a mystery. It was shown that the planned targets do not really determine the actual growth rates – they are less informative in predicting the actual outcome than simple extrapolations based on past trends – but it

is still not clear what were the real determinants of growth process in the CPE.

The accuracy of central planning was disappointing, the discrepancy between planned targets and actual indicators was large even for macroeconomic indicators, as the table 2 below shows. For the first five year plans (1930s-1940s) the average deviation was 39 to 58%, it decreased to 14-19% in the 1950-60s, but increased again to 27-31% in the 1970-80s (table 2).

**Table 2.** Ratio of actual to planned growth rates of key indicators, by Five-Year Plan periods, %

Indicator	First Five-Year Plan, 1928/29-32-33 <sup>a</sup>		Second Five-Year Plan, 1933-37	Fourth Five-Year Plan, 1946-50	Fifth Five-Year Plan, 1951-56
	Initial variant	Optimal variant			
National income produced	76	60	93	168	113
Utilized national income					
Gross industrial output	105	87	105	152	121
- production of means of production	153	116	143	-	114
- production of objects of consumption	66	59	74	-	117
Gross agricultural output	-44	-33	25	-4	-
Labor productivity					
- in industry					88
- in construction		5	106	125	82
- in agriculture				62	92
Retail trade			32	36	127
Real incomes			20 <sup>b</sup>		111 <sup>b</sup>
Average deviation of actual growth rates from planned (in either direction), % of planned growth	52	56	39	58	16
Indicator	Seven-Year Plan 1959-65	Eighth Five- Year Plan, 1966-70	Ninth Five-Year Plan, 1971-75	Tenth Five-Year Plan, 1976-80	Eleventh Five-Year Plan, 1981-85
National income produced	94	114	-	-	-
Utilized national income			72	80	92
Gross industrial output	105	103	91	67	77

- production of means of production	112	101			
- production of objects of consumption	94	112			
Gross agricultural output	21	84	68	56	42
Labor productivity					
- in industry	88	93	87	55	74
- in construction	85	59	78	36	93
- in agriculture	75	87	20	53	34
Retail trade	97	120	86	84	70
Real incomes	75	110	80	85	67
Average deviation of actual growth rates from planned (in either direction), % of planned growth	19	14	27	36	31

<sup>a</sup> *Planned indicators calculated by fiscal year, beginning October 1; actual rates by calendar year.*

<sup>b</sup> *Real wages.*

*Source: EKO, 1987, N.11, pp. 37-50.*

But the plans were not fulfilled on time and pervasive shortages emerged. The hypothesis of this paper is that the real work mechanism of the CPE was triggered by prioritized investment projects that were the first to receive financing from the budget or state banks. When these projects created the demand for materials and supplies, shortages emerged and demand impulses precipitated through the rest of the economy causing increases in prices and output.

Structural shortages – scarce supply of some goods and excess inventories of the other goods – are easy to explain: these were the natural and logical consequence of the inability of the planners to produce a balanced plan and to set prices for millions of goods and services at the market clearing level (Campbell, 1958; Shmelev, Popov, 1989). But the general shortages, i.e. pervasive scarcity of most, if not all goods, is still a puzzle because a simple increase in prices could have eliminated them and helped to avoid many nuisances associated with constant scarcity. Even more so, that these shortages most of the time were not really significant and could have been eliminated by relatively modest price increases (Popov, 2020).

The explanation suggested in this paper is that the growth mechanism of the CPE was based on cycles of creating shortages and their elimination: prioritized investment projects financed by the state increased the demand for labor and materials => there emerged shortages of materials and supplies, which resulted in creeping uncontrolled inflation for some goods and organized price hikes for the other => higher prices led to higher profitability => higher profitability

allowed to finance investment and increases in production.

## The shortage economy did not result from soft budget constraints. It is the multiplier process that created and alleviated shortages under central planning

Two most well-known features of the CPE – shortage economy and soft budget constraints (SBC), both were described initially by Janos Kornai (Kornai, 1980; Lindbeck, 2007). "In our day and age, – argues Grzegorz Kolodko (2018), – there is basically a consensus that in the case of real socialism it was the state ownership of means of production that caused the soft budget constraints, and these, in turn, caused inflation – more or less repressed or more or less open, depending on time and place, so depending on the systemic and political context".

"The main finding, a conception which now forms the central maintained hypothesis of Kornai's school of thought, is that the socialist economy is characterized by endemic and persistent shortage; moreover that this shortage is maintained over time by a variety of mechanisms all grounded in rational behavior by enterprises, central planners and other agents given their information and expectations, the constraints they experience, and the organizational structures which tie the system together" (Hare, 1989).

The shortage economy is believed to be connected with the soft budget constraints. Lindbeck (2007) claimed that "Kornai's two most celebrated characterizations of real world socialist economies – "shortage economies" and production units with "soft budget constraints" – are analytically closely connected".

In reality the shortage economy is not connected at all with the soft budget constraints (Popov, 2020a, b). Budget constraints were much harder in former socialist economies than in market economies – in developing countries of the same level of development and even in advanced capitalist economies. And whenever the soft budget constraints were present in socialist economies, it was industrial policy, sometimes good (export orientation in China and Vietnam), sometimes not so good (import substitution in Eastern Europe and former Soviet Union), but definitely not the policy caused by inability of the state to resist the pressure from the loss-making state enterprises to finance their losses (Popov, 2020a).

The true *raison d'être* for the pervasive shortages was the CPE mechanism of growth itself. This mechanism was associated not so much with the plan (it was physically impossible to create a balanced plan anyway), but with the small and big pushes to the economy that came from the financing of the projects that were prioritized. Such a financing started with the allocation of funds for capital investment from the state budget and/or credits from the state banks and triggered a process shown at fig. 3.

New project – say, construction of a railway or a new plant – led to the increase in demand for the supplies that resulted in shortages of particular materials and components. A shortage of supplies allowed producing plants to ask for price increases and to get an "understanding" from the head of construction project where supplies were needed (they knew that otherwise they will not get the supplies at all), and such an "understanding" was a persuasive argument for the State

Committee on Prices to agree to price hike.

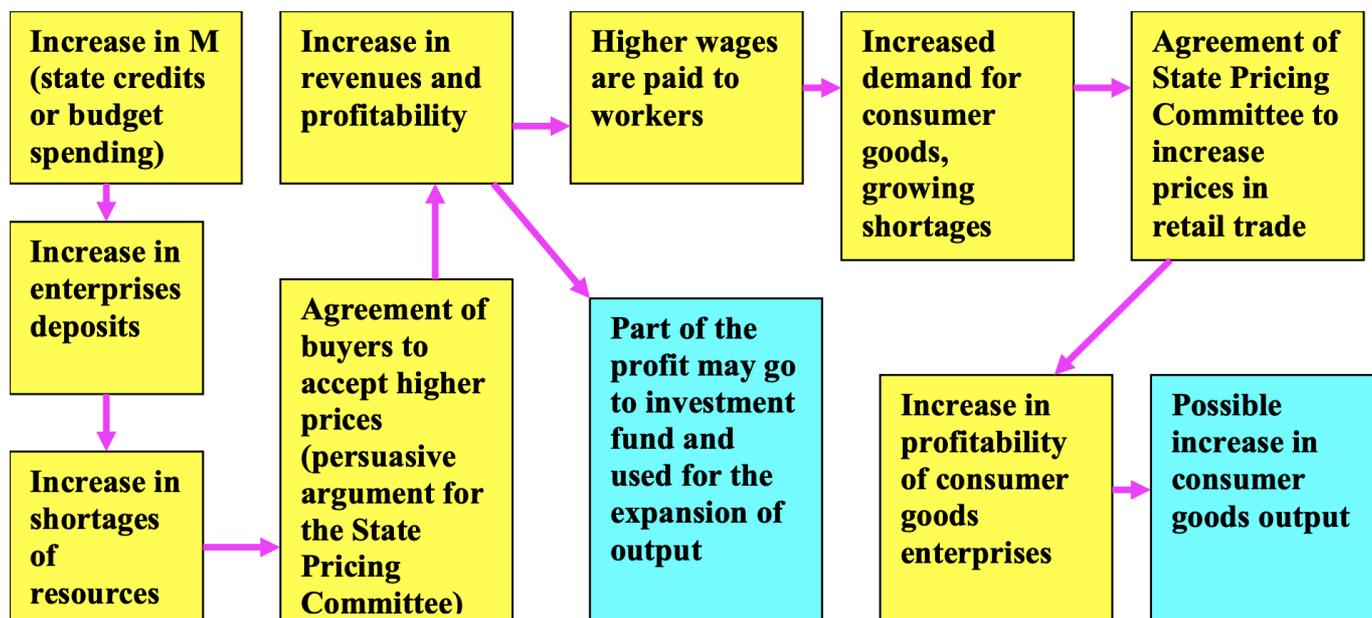
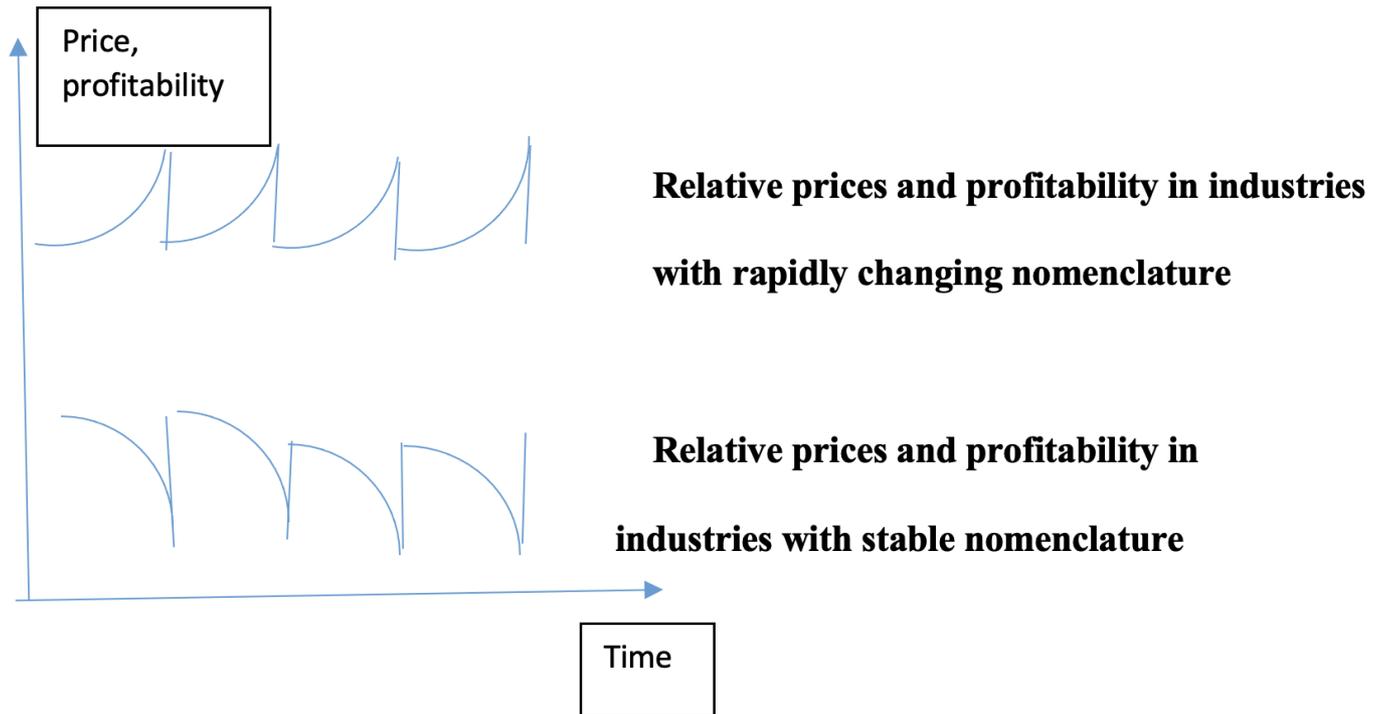


Figure 3. How the increase in money supply leads to the increase in prices and output in the CPE

Sometimes the price increases occurred in a creeping way – via transition to the new varieties of products: in industries with the large and rapidly changing nomenclature of output (machine building, consumer goods, construction, services) introduction of the “new” product that was basically the same as the old one, but with few bells and whistles, was a widely used method of increasing prices. The calculation of the higher costs reflecting the “higher quality” was sent to the State Committee of Prices and eventually approved – the officials of the Committee knew all these tricks, but were physically incapable to check millions of new calculations.

In other cases, in industries that produced few varieties of products and had stable nomenclature (resource industries, agriculture) prices were increased by the regulator (State Pricing Committee) periodically in a one-time hike: it was necessary to do it every 5-7 years because the creeping inflation constantly going on in other industries that delivered supplies to resource industries and agriculture undermined their profitability (fig. 4).



**Figure 4.** Price cycle and profitability cycle in industries with slowly and rapidly changing nomenclature of goods

Thus agriculture and resource industries periodically experienced the decline in their profitability and were even getting into red before a one-time price increase for their produce restored their profitability to make it comparable with the other industries (Shmelev, Popov, 1989). As fig. 5 shows, the profitability of machine-building, light industry, construction, communication, and food industry in the USSR was the highest, whereas fuel and electricity, transportation and agriculture were low profitable.

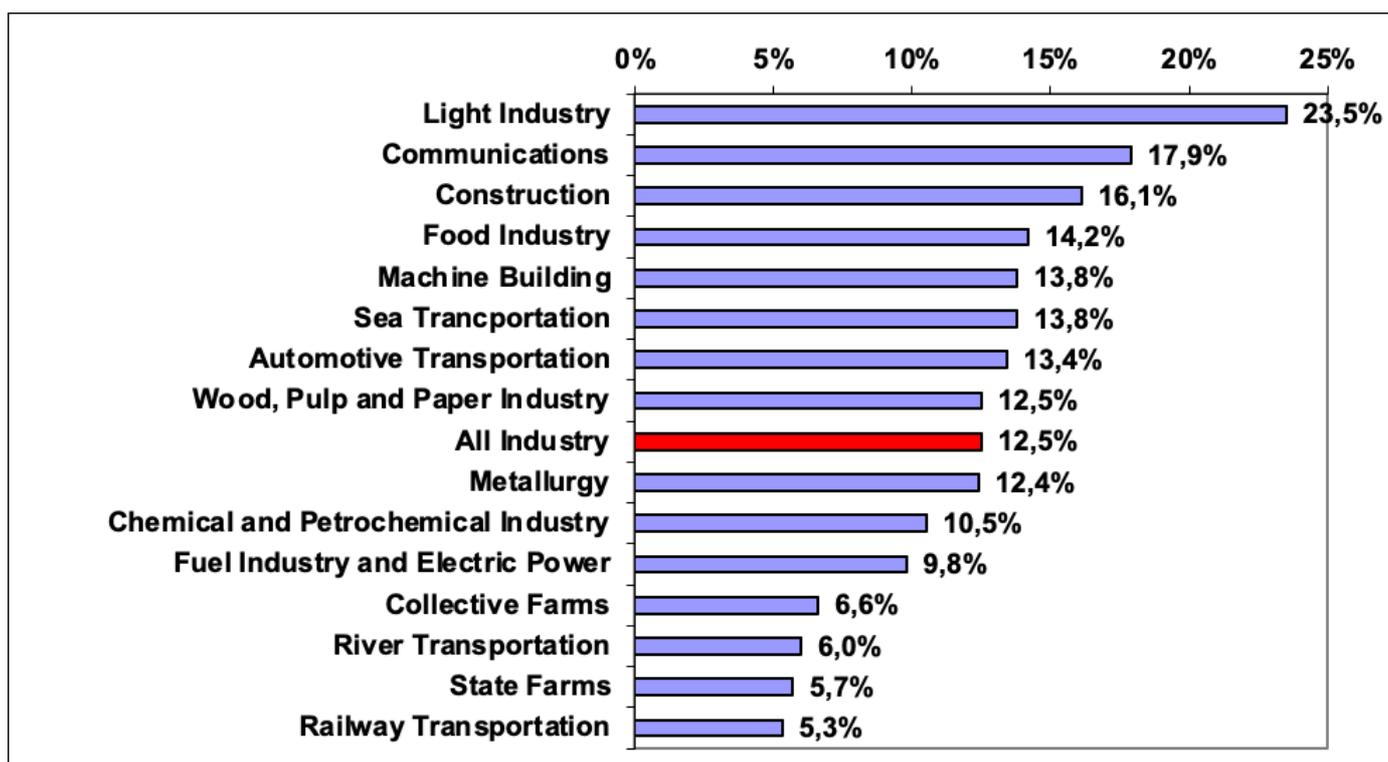


Figure 5. Profitability of particular industries in the USSR in 1986, %

Source: Goskomstat.

Price increases in both groups of industries led to the greater profitability and higher wages (wage fund was planned *de facto* as a percent of the total output and higher profits allowed to pay bonuses to workers), whereas higher profitability allowed to expand output because part of the profit could have been used for investment into the expansion of production capacities (fig.2). As a result, the initial small and big impulses generated by the prioritized investment projects transformed themselves into price and output increases – pretty much like it happens in a market economy as a result of the increase in government spending and/or expansion of the money supply.

Shortages and excess inventories were inevitable in CPE almost by definition. But it was not only a structural mismatch – the total value of shortages exceeded that of excess inventories. Excess demand created by priority investment projects in particular industries was a driving force of CPE and precipitated into the rest of the economy via the multiplier process of chain increases of prices and output.

Capital investment was regarded as a major tool of eliminating the bottlenecks resulting from shortages. So capital investment was diverted to areas where new production capacities were needed to expand the production of scarce goods. The whole planning process thus looked like an endless chain of the urgent decisions forced by emergency shortages of different goods that appeared faster than the planners were able to eliminate them. This was a sort of a vicious circle, a permanent race against time, in which decisions to make capital investment were predetermined by existing and newly emerging shortages. And this was the transmission mechanism for the increase in output and prices – it was causing both, inflation and economic growth.

## CPE operated through market mechanisms

There is a well-known relationship between the expansion of money supply and the growth of prices and output. Normally, the increase in the money supply is causing some growth of output in the first 12-18 months and then triggers the increase in prices (inflation). If the economy operates close to the potential (low unemployment and high capacity utilization), impulses of the money supply expansion are causing more inflation and less output growth, but in case of the large output gap (between potential and actual output), there is a good chance to expect that money supply impulse would result predominantly in output growth, not in inflation. In any case, *ceteris paribus* (or to be more precise, in the absence of changes in money velocity), increase in the money supply is exactly equal to the increase in output in current prices, which in turn is equal to the sum of growth and inflation. Fig. 6 confirms that the money velocity is in fact quite stable – in the US in the 1960-80s the fluctuations of the growth rates of money supply were very much in line with the fluctuations of the growth rates of GDP in current prices.

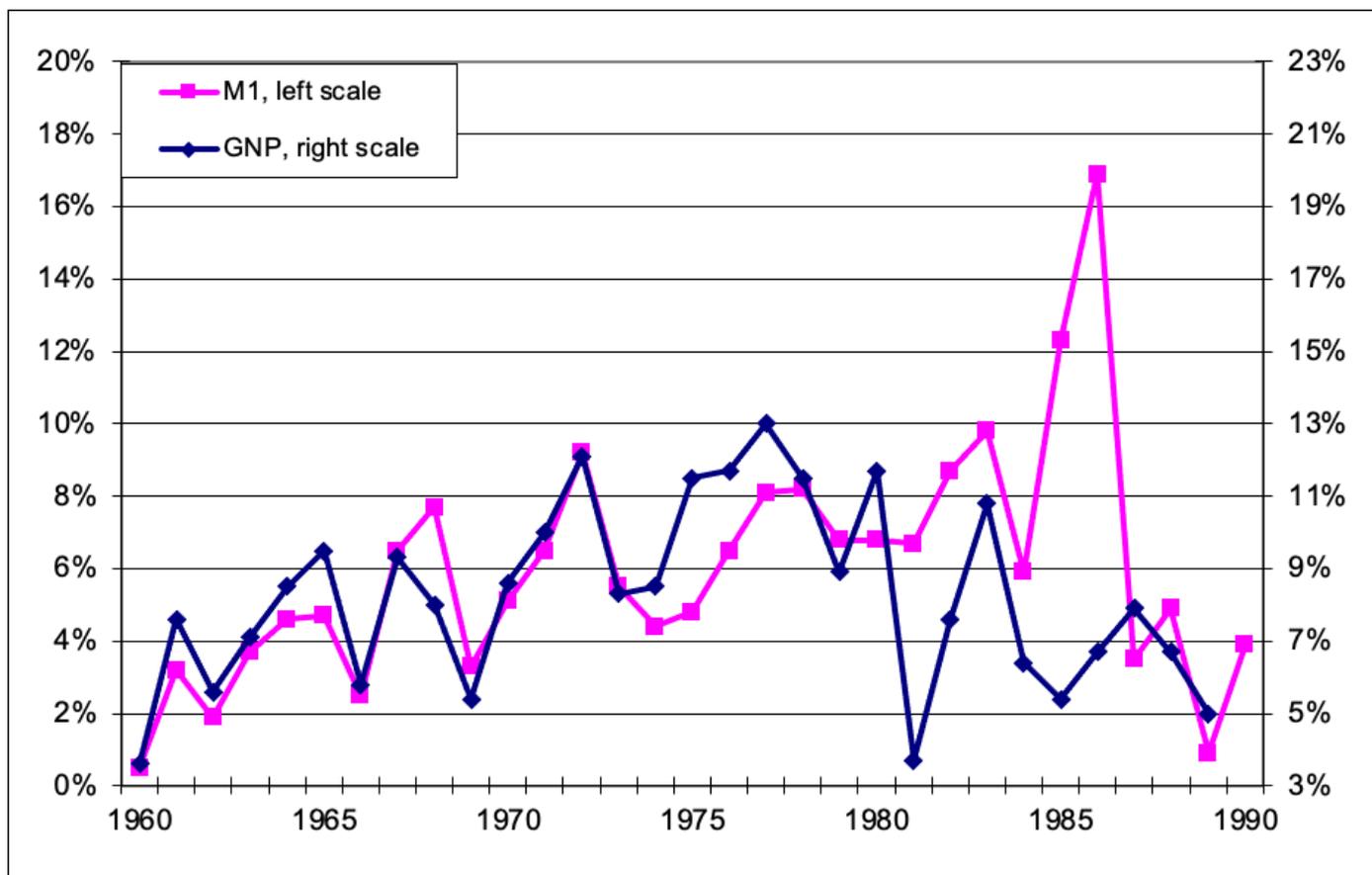


Figure 6. US money supply and GNP, annual growth rates, %

Source: Economic Report of the President.

It may be surprising to see the same relationship in the CPEs – planning of the money supply was carried out by the State Bank (*Gosbank*), planning of prices – by State Committee on Prices (*Goskomtsen*), planning of output – by the State

Planning Committee (*Gosplan*) and branch-industry ministries, and yet, in 1-2 years, these indicators fell into the relationship typical for the market economy. Growth rates of the national income in current prices in the USSR in the 1960s-80s, sometimes without the lag and sometimes with a lag of 1 year, reflected the fluctuations of the growth rates of most important component of money supply – deposits of enterprises (fig. 7).

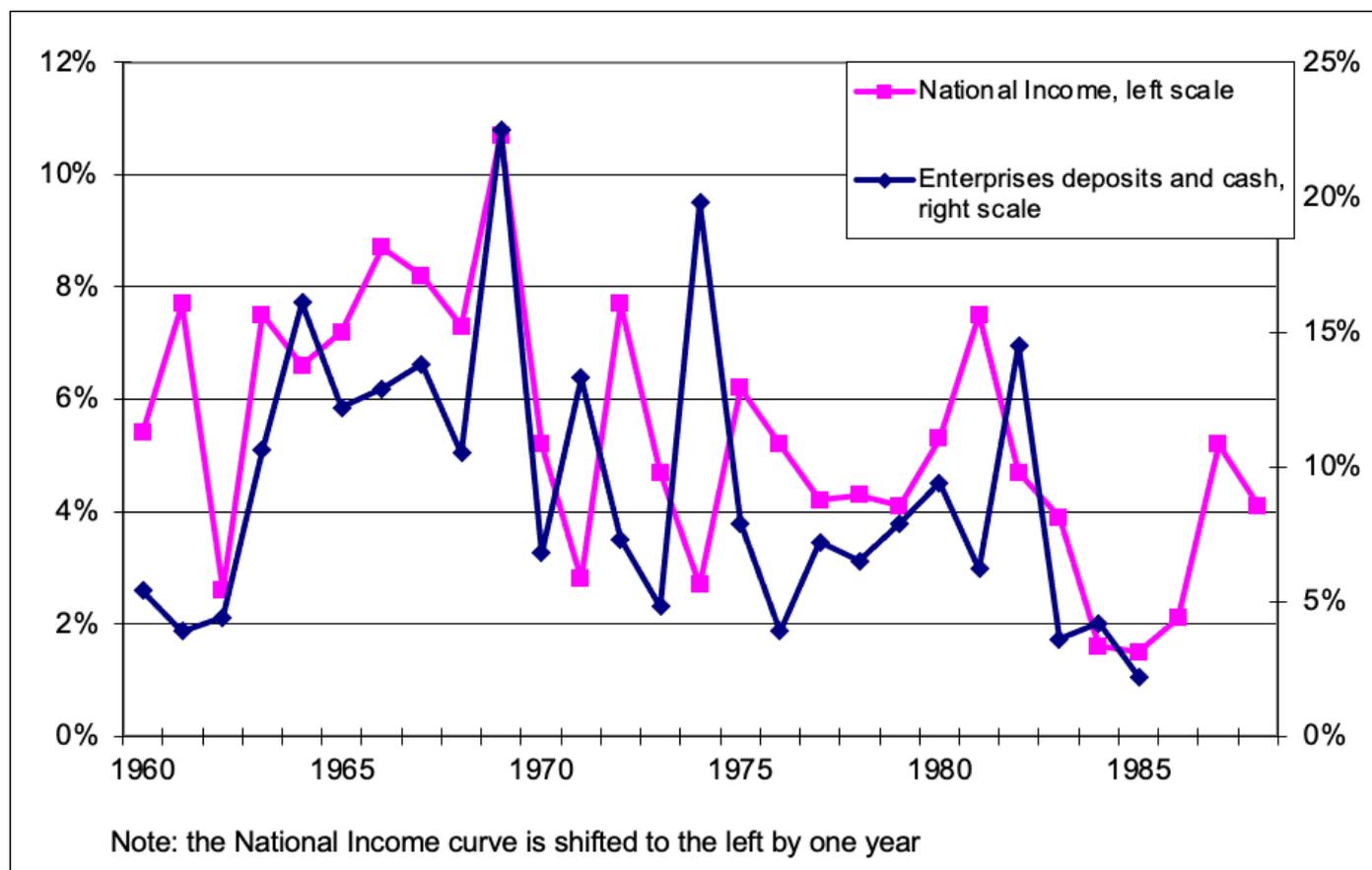


Figure 7. Enterprises deposits and national income in current prices, annual growth rates, %

Source: Goskomstat.

And the variations in the growth rates of enterprises' deposits with a lag of about one year led to the fluctuations in wages growth rate (fig. 8). Finally, growth rates of personal deposits were quite correlated with the growth rates of retail sales – again, with a one-year lag (fig. 9).

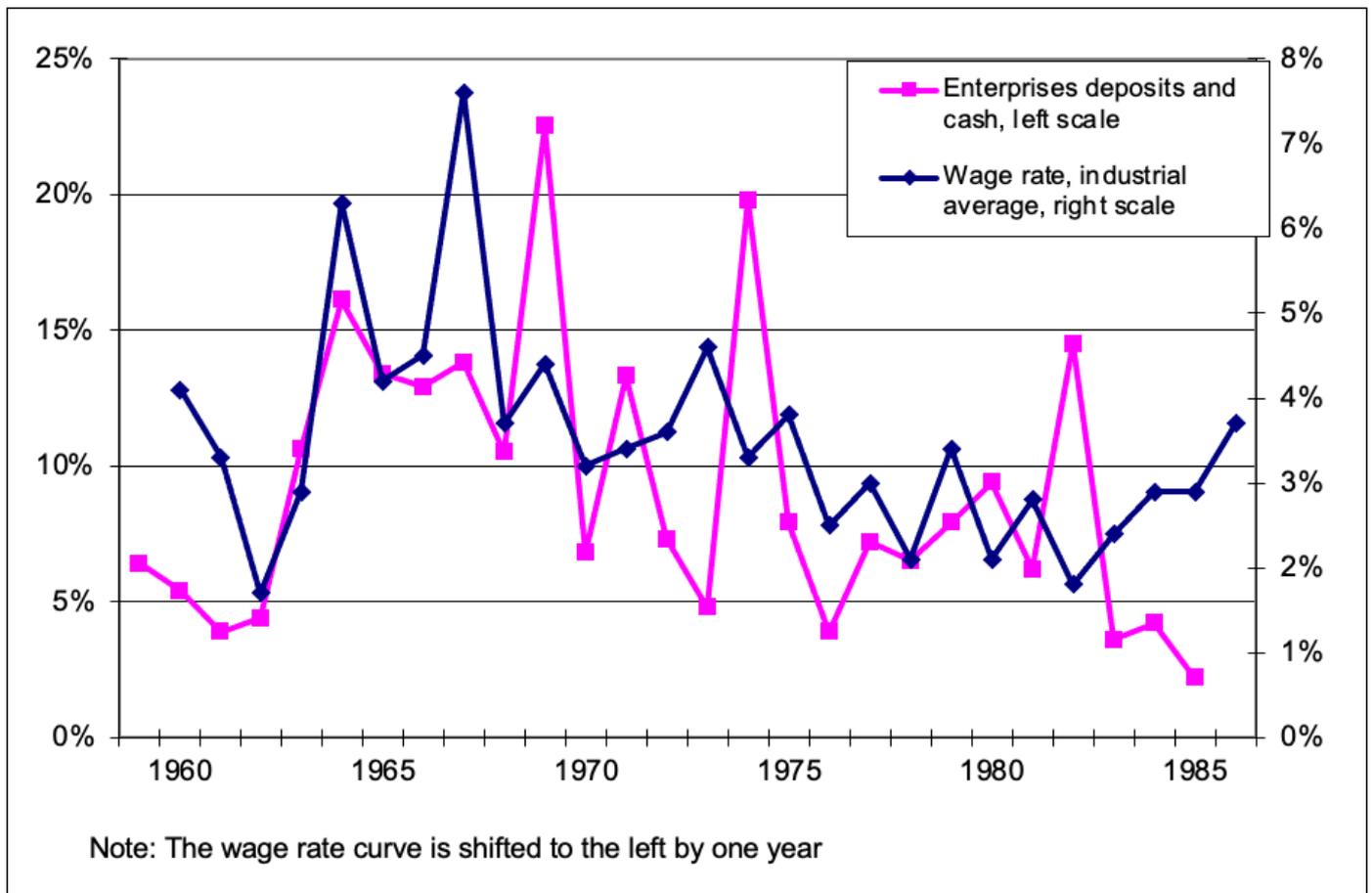


Figure 8. Money supply and wages, annual growth rates, %

Source: Goskomstat.

This relationship between the growth of money supply and growth of prices and output, and increase in wages and retail sales confirms in the first approximation the hypothesis about growth mechanism in the CPE: when money supply expands due to increased financing of particular investment projects, there are automatic mechanisms at play to transmit the initial impulse into other industries, so it causes the increase in prices, output and wages.

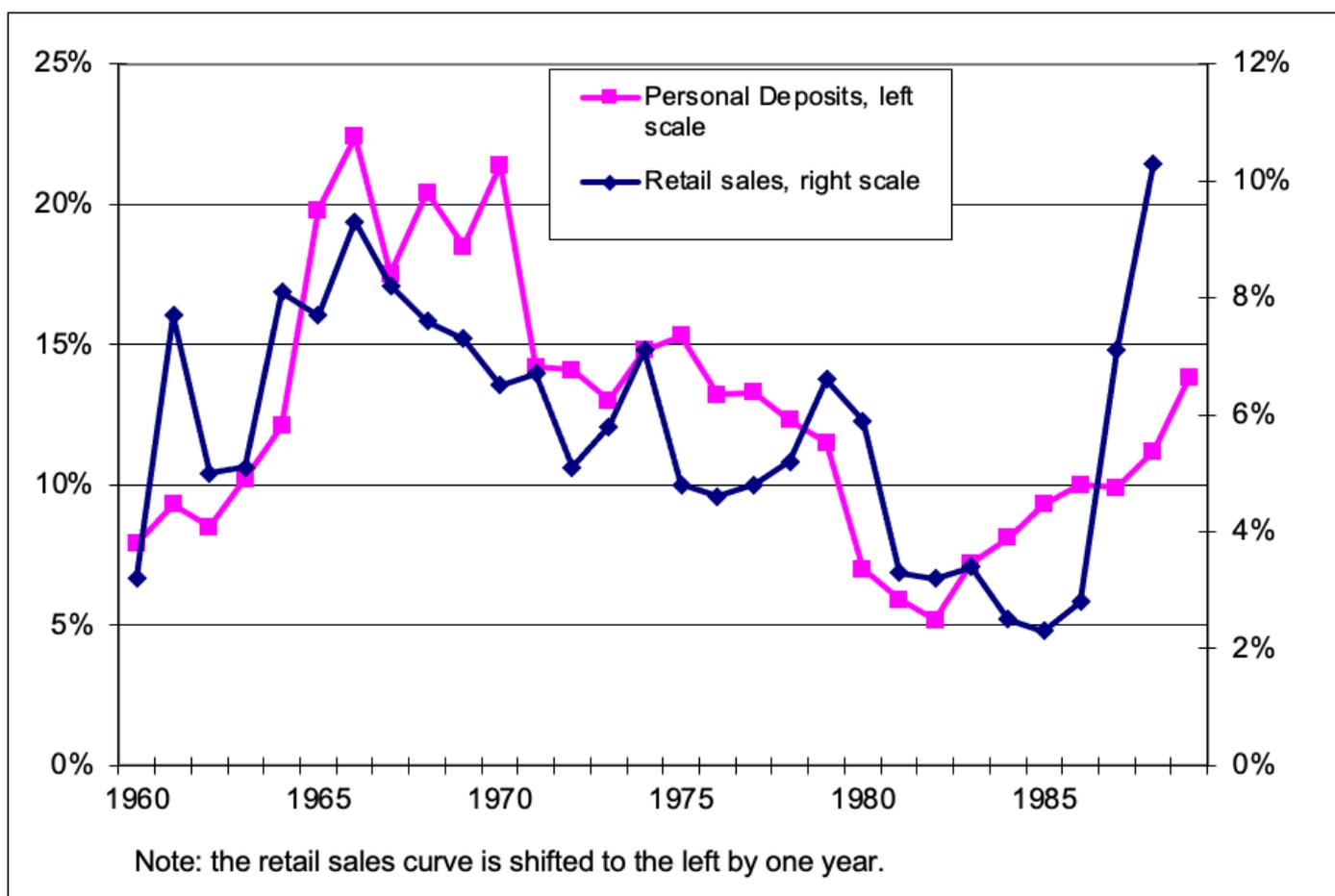


Figure 9. Personal bank deposits and retail sales in current prices, annual growth rates, %

Source: Goskomstat.

## Conclusions

Overall the record of the Soviet Union in maintaining economic growth and high level of welfare indicators is quite spectacular, especially until the mid-1960s. The major strength of the CPE in the 1950-70s came from its ability to mobilize savings and to turn them into investment. After the Second World War the “big push” (industrialization) of the 1930s started to pay off – massive retirement of fixed capital stock has not yet started, so new investment could have been used to alleviate inherent supply bottlenecks.

Since the mid-1960s, however, growth started to slow down, whereas social evils – mortality, crime, murders, suicides, alcohol consumption – started to increase. In political and social life Khrushchev thaw came to an end by mid 1960s (Khrushchev was removed from power in 1964), and the hopes of transforming the Soviet regime into “socialism with human face” were buried in 1968, when the Soviet troops were moved into Czechoslovakia. The primary reason for the slowdown of growth was the inability of the CPE to replace the retiring fixed capital stock without aggravating shortages. When in the 1960s, 30 years after the “big push”, time finally came to make such investment, the economy started to slow down.

The 1950-70s is the period when the drawbacks of the CPE (economic calculation problem) started to outweigh the

advantages (ability to mobilize savings for investment). Centrally planned economy (CPE) is sometimes characterized as an antonym of a market economy, but this is not true. The ability of the central planning authority to develop and implement a coherent balanced plan for the national economy (not even to speak about the optimal plan) is limited and hence the vacuum is being filled with the automatic mechanisms of self-regulation that are in essence similar to the market adjustment process, but less efficient.

In particular, fiscal and monetary shocks in the CPE lead to the increase in output and prices, very much like the fiscal and monetary impulses in the market economy. The mechanism of the transmission of these impulses implies the emergence of shortages due to the launch of small and big investment projects and the elimination of these shortages through largely self-propelled process of price and output increases. Initial investment led to shortages of supplies, which triggered creeping price increases for scarce goods, which in turn boosted profitability in respective industries allowing them to increase output. *De facto* it was a market economy multiplier process – fiscal and monetary expansion leading to the price and output increases that eventually balanced supply and demand.

Such an interpretation explains the large gap between the planned targets and actual indicators. Even though it was demonstrated that the growth rates of the CPE are not really determined by the planners and planned targets, it was not really clear, what are the true determinants of the variations of growth rates. This paper argues that the planners influenced the development of the national economies not so much via adopting the planned targets, but by choosing the investment projects to be launched first. The financing of these projects gave impulses to the other industries via multiplier process that triggered either price increases or output increases, depending on the gap between the potential and actual output, very much like in a market economy.

The CPE was inferior to the market economy in ensuring equilibrium in the goods market: the planners were not able to equate supply of and demand for millions of goods, so investment into new production capacities we crucial for alleviating shortages. But when retirement of the fixed capital stock increased (20-30 years after the “big push” of the 1930s) high savings were inevitably absorbed by the investment to replace of retiring capital, so the most important advantage of the CPE (high investment into new production capacity) started to gradually vanish. The result was the slowdown of growth rates up to the point of virtual stagnation by the end of 1980s with the resulting deterioration of social indicators.

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