The Decline of the Soviet Union:
A Hypothesis on Industrial Paradigms, Technological Revolutions and the Roots of Perestroika

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The Decline of the Soviet Union:
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Why did the USSR collapse? This has been one of the most debated and contested questions in the social sciences in recent decades. Various theories have been advanced to explain this phenomenon.

Many authors have emphasized the economic sphere. Following (or not) von Mises´s and Hayek´s critique of socialist economies as inherently wasteful and inefficient due to the absence of market prices as optimal resource allocators, some merely confirmed that the Soviet system was doomed from the start (Hayek 1944 and 1988; von Mises 1951; Boettke 1993). Others, less deterministic, emphasized the difficulties the Soviet economy encountered in specific time periods, especially during the period of the so-called scientific-technical revolution or third industrial revolution (Goldman 1987; Knight 1991; Castels & Kiselyova 1995).

The political sphere was considered critical by a host of observers (Hanson 1991; Kenez 1999; Kotkin 2008; Kotz & Weir, 2006; Brown 2009). In particular, the lack of political freedom was deemed to have created an unbridgeable gap between the leaders and the people, thus unmasking the farce of Soviet socialist equality. Even Marxist critics exposed the increasing alienation felt by the workers and people of the Soviet Union. (Mandel 1989; Buzgalin & Kolganov 2003) This would lead to the "pressure cooker" model of increasing tensions culminating in an explosion towards the end of perestroika. These political issues became especially acute when the nationalities problem came to the fore with full force. The ethnic tensions that gave rise to open conflicts like that of Nagorno-Karabach between Armenians and Azerbaijanis generated a whole literature on the "nationalities problem" (Carrére d´Encausse, 1978 and 1993; Walker 2003; Stankevich 2005; Cheshko 2005).

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The main economic and political explanations tend to be structural, but both strands also have context-oriented or personalistic variants which tend to emphasize specific inauspicious conjunctures, misguided policies or incompetent leaders as prime causes of perestroika´s final debacle (Goldman 1991; Kuznetsov, 1997; Hough 1997). Favorite among these are the ones that blame the breakup of the USSR on the weak leadership by Gorbachev (Ligachev 2010).

Other authors search for alternative explanations in different areas, such as social life and foreign policy. Moshe Lewin, for example, stressed the contradictions between the processes of increasing urbanization and cultural sophistication in Soviet society on one side and the incapacity to adapt to the new conditions of the political/bureaucratic establishment on the other (Lewin 2005). Nick Bisley argued that the end of the cold war proved fatal to the Soviet regime insofar as the cold war itself structured and gave legitimacy to the USSR as a militaristic political and economic machine. Having lost its *raison d'être* the Soviet Union would eventually go into disarray (Bisley 2004).

Single-factor explanations tend to be one-sided. Therefore, as stressed by A. Kalashnikov, many authors, particularly in textbook-style writing, adopt a varying mix of these different explaining factors in order to put forward their own vision of the events leading up to the dissolution of the USSR (Marples 2004; Smith 2005; Kalashnikov 2011).

The "decline"

However, investigating the causes of the "collapse" or "fall" of the USSR is not exactly the same as looking into the reasons of its "decline". For instance, when one wonders what reasons led the Soviet leadership to initiate perestroika, the answer may be rather straightforward. In his famous, introductory book *Perestroika: New Thinking for Our Country and the World* Gorbachev set out to explain to the world the new phase in Soviet life and spelled out the exact factors that prodded the communist leaders to initiate that process.

> Let me first explain the far-from-simple situation which had developed in the country by the eighties and which made perestroika necessary and inevitable [...] Analyzing the situation, we first discovered a slowing economic growth. In the last fifteen years the national income growth rates had declined by more than a half and by the beginning of the eighties had fallen to a level close to economic stagnation. A country that was once quickly closing on the world´s advanced nations began to lose one position after another. Moreover, the gap in the efficiency of production, quality of products, scientific and economic development, the production of advanced technology and the use of advanced techniques began to widen, and not to our advantage […] And all this happened at a time when scientific and technical revolution opened up new prospects for economic and social progress. (Gorbachev 1987, pp. 18-19)

Three main points stand out in this explanation of the factors that led the Soviet leadership to enact perestroika. There was a economic slowdown "in the last fifteen years" (*i.e.*, from the seventies on) accompanied by lagging in the technological race with the developed capitalist countries; and all this occurred in the period of the so-called "scientific-technical revolution" (*nauchno-tekhnicheskaya revolyutsiya*, a technical term in the Russian original language).

Therefore economic factors (and their scientific-technological consequences) held a central place in the considerations that led to the unleashing of the perestroika process. In other words, the Soviet Union was already declining *before perestroika started*. Since this decline was crucial for the decision to initiate perestroika, in order to understand the causes of perestroika (in the sense of the factors that led to it) we have to look into this pre-perestroika decline.

Let´s start by quantitatively checking the economic slowdown mentioned by Gorbachev. According to official Soviet statistics, the rates of economic growth for the USSR since the 1930's — with the exception of the World War II years — were:

Table 1: Average annual rates of growth of Soviet National Income (Net Material Product)

1929-41	1946-1950	1951-1960	1961-1970	1971-1975	1976-1980	1981-1985
13.9%	11.9%	10.2%	7.2%	5.7%	4.3%	3.2%

Source: Narodnoe Khozyaistvo SSSR (various years) and Khanin, 1988, p. 84.

A glimpse at table 1 shows us that the Soviet Union, after having experienced very high peacetime economic growth in the 1930's, 1940's and 1950's (yearly averages above 10%), saw a sharp deceleration in the following decades. The national income of the USSR grew by yearly averages of 10.2% in 1951-60, 7.2% in 1961-70 and 5.7% between 1971 and 1975. Growth was never again substantially over the 5% mark in the years from 1975 to the beginning of Perestroika in 1985.

The steep economic deceleration which started in the 1960´s (some would say even in the 1950´s) and reached worrisome dimensions after 1975 coincided chronologically with another process of the world economy: the intensification of the so-called third industrial (technological) revolution (or scientific-technical revolution as it was called in the socialist countries).[2] The third industrial revolution started after World War II with the development of *computers* (initially for scientific use). It intensified in

[2] In spite of some conceptual variations between them, the terms "scientific-technical revolution" (mainly utilized by authors from the former socialist countries), "third industrial revolution" or "third technological revolution" designate the same general historical period of introduction and development of new productive processes based on electronics, namely the decades after World War II (1945) up to the nineties. I personally prefer the terminology of Ernest Mandel who reserved the expression "industrial revolution" to the original 18th century developments which began in England and postulated, then, the existence of a "second technological revolution" (from the 1890's to World War II, characterized by the generalized application of electric and combustion engines) and a "third technological revolution" (from 1945 on, characterized by the generalized control of machines by means of electronic apparatuses) (Mandel 1976, pp. 120-21). In order not to get bogged down over semantics, I will use the terms interchangeably in this article noting, however, the definition I will shortly give of this scientific-technical revolution as the process that started in the 1950´s with computerization, grew in the 1960´s with robotics and matured in the 1970´s with microelectronics.

the 1960's with the advent of *robotics* (the inauguration of the first industrial robot in 1961 signaled the invasion of computerization into industrial production). Finally, it achieved the contours of an information society in the seventies with the boom of *telemetry* (transmission of data over distances) enabled by *microelectronics*. The period of the scientific-technical revolution (STR) also marks the overtaking of the rigid Fordist industrialization model by new paradigms of *flexible specialization* (*e.g.*, the Toyota production system). The mid-seventies not only saw the beginning of the overall acknowledgement of the productive superiority of the flexible industrial paradigm of Toyotism over Fordism, but also was the time when the Soviet model showed clear signs of "exhaustion", with the technological gap with the West widening visibly. Was this "parallelism" between what was happening in the world (under the STR) and what was happening in the Soviet Union (economic slowdown, technological gap) a mere temporal coincidence? I believe that there was a correlation between these processes. But how exactly? For that we need to make an historical excursus into the characteristics of the capitalist industrial system during the second and third technological revolutions and then show the links between them and what was happening in the USSR.

Second industrial revolution

As Ernest Mandel pointed out, the period preceding the turn to the twentieth century, with the creation of modern monopoly capitalism and incorporation of colonies to the metropolises, propitiated an enlargement of the world market. These favorable conditions for capital accumulation were reflected in an upsurge of investments in new productive processes. From the 1890's on, a boom of innovations marked the inception of the second technological revolution of capitalism (Mandel 1976). Also called by some authors the second industrial revolution, it was characterized by the application of electric and combustion engines. Industrial production was now based on electromechanical processes. Electricity provided a more reliable power source than the ones existing before (*e.g.*, steam engines). This increased

the technical possibilities of the machine tools and other industrial apparatuses and paved the road to the appearance of the phenomenon of *mass production* in the beginning of the 20th century. For mass production to appear, two consequent developments were instrumental: Taylorism and Fordism.

Frederick Winslow Taylor, in his book *The Principles of Scientific Management*, proposed new methods of industrial labor management (Taylor 1911). He had noticed how many extraneous motions were performed by workers in a typical workday. Taylor, then, divided each task into its basic component movements and searched for "the one best way" of performing each movement with the least possible expenditure of time and energy. Whereas before the Taylorist method the laborers executed the tasks in their own way (according to their individual experiences), now Taylor proposed that the administration *scientifically* study the most efficient way to perform the motions (and the tasks in general) and have the laborer work in this way. In other words, the control of the techniques, the way of working, was transfered from the worker to management. Taylorism was characterized by "fragmentation" (of tasks), "allocation" (of rhythms) and an increasing separation between *conception* and *execution* (Coriat 1991).

Besides Taylorism, factory shop-floor labor underwent other radical modifications with the introduction of the *Fordist assembly line*. Before that, at the end of the 18th and for most of 19th century, the lay-out of the machines in a factory was based on functional principles, that is, the machines were allocated according to their functions:

> […] the lathes would be grouped in one location, the grinders in another, and the drills in yet another. Production involved moving materials and semi-finished products around the factory in batches. Thus a batch might start in the milling area before proceeding to the grinding shop ...[then] to the boring department before proceeding to subassembly department. Every product in a batch would complete each machining operation before the batch could proceed to the next operation. (Best 1990, p. 52)

In the late 19th century, the principle of flow was applied to production. "The idea of a flowline is to lay out the machines in order of the machining operation. Thus, instead of transporting batches from department to department, the machining operations would be laid out in a series that corresponded to the sequence required for production" (*ibid.* p. 53). By avoiding the cumbersome transport of whole batches from department to department, flowlines made the operations smoother and faster (avoiding bottlenecks and delays). Continuous flow processes were first utilized in refining and distilling industries (*ibid.* p. 54). Ford's breakthrough was to introduce the processes of flowline in the metalurgical industries with the addition of conveyor belts (*ibid*.). Whereas before the workers in the factory carried the parts from one machine to the other, now they just remained seated, working on these parts, which reached them automatically, by means of the conveyor belts. The gains in productivity were enormous. Thus, the transfer of control of the rhythm of work from the worker himself to management was completed — the administrators could choose the desired speed of the conveyor belts (*ibid.*, p. 52).

Thus, the period of the Second Technological Revolution was characterized by an electromechanical technical basis of its industrial system, with the utilization of Taylorist and Fordist techniques.[3] The gains in productivity were enormous,[4] inaugurating the era of mass production for a mass market.

Third technological revolution

Since the end of World War II (and accompanying the invention and development of computers) a new production revolution has happened: electronic processes have replaced mere electromechanical processes as the technological basis of the industrial production system. *Numerical control* (*i.e*., devices for control of machines by means of pre-programmed tapes) was attached to the traditional machine tools,

[3] Unlike French regulation school theorists (including Benjamin Coriat himself on this point), I hold the position that Fordism subsumed the principles of Taylorism, which preceded it in time. Thus, when we say that the second technological revolution was marked by Fordism, it includes the Taylorist tenets absorbed by the main paradigm.

[4] By 1914, when Ford introduced the moving assembly line (with automated conveyor belts), the time required in his Highland Park plant to assemble the major components into a finished car was about 8 times less than in factories still using the traditional techniques of craft production (Womack, Jones & Roos 1990, p. 29).

thus creating NC (Numerically Controlled) machine tools. Despite being powered by electricity, the machine tools of the period of the second technological revolution were usually handled manually by an operator who activated them and guided their separate operations on individual parts. With NC (numerical control), this manual intervention of the operator at all stages of the utilization of the machine tool becomes superfluous., since the numerically controlled machine tools have a program in their numerical control panel which enables the machine to perform pre-programmed sequences of operations automatically. The operator's task is often just to supervise the work of the machine, intervening only if something goes wrong.

The gains in productivity due to these technological advances were also enormous. For example, with the introduction of the transfer line, the milling time for the engine block of an automobile was reduced from 9 hours to 14.6 minutes! (Coriat 1990, p. 40).

Thus, the third technological revolution is characterized by breakthroughs which will eventually make it possible to reach — by means of electronic computerization — the stage of completely automated production systems. The coming together of *computerization* (developed in the 1950's), *robotics* (1960's) and *telemetry/microelectronics* (1970's) gave definitive contours to this technological revolution, which has brought about the age of the so-called information society.

As to the innovations and technological breakthroughs which have directly affected the industrial sector, we can mention the NC (Numerically Controlled) machine tools, CNC (Computer Numerically Controlled) machine tools, DNC (Direct Numerical Control), the transfer line, FMM (Flexible Manufacturing Modules), FMS (Flexible Manufacturing Systems) and CAD(-)CAM (Computer-Aided Design [and] Computer-Aided Manufacturing) systems.

Toyotism and the new types of flexible paradigms

These purely technological breakthroughs were accompanied by revolutionary changes in the organizational-managerial methods of production. Just as Taylorism and Fordism revealed themselves as the most progressive methods during the Second Technological Revolution, a new organizational paradigm overwhelmed the others in the course of the Third Technological Revolution, revealing itself as the one which enabled the best and most efficient use of the possibilities of the technological breakthroughs of this period: Toyotism.[5]

Before examining the nature of this new paradigm, it is important to note that Fordism constituted a fairly *rigid* production paradigm. The main objective of a typically Fordist assembly line was to mass produce enormous quantities of identical, standardized products, with the least possible variation among them. This was intimately connected to the logic of *economies of scale*: the more identical products were produced, the least the marginal cost of each additional unit. Once machinery was installed in a Fordist plant, it was supposed to work uninterruptedly and in a standard manner — it would be very costly to interrupt the flow of the assembly line in order to modify the way the operations are performed. This rigidity, this lack of flexibility for variations and modifications, did not constitute a big problem in Taylor's and Ford's times. The beginnings of the Second Technological Revolution marked also the beginnings of the mass market and mass consumption. Fordism and mass consumption complemented each other. The decrease in costs brought about by the standardization of parts and Fordist mass production stimulated consumption, and this enlarged consumption, in turn, provided the stimulus for the factories to enlarge their scales of production. The Fordist *rigidity* (= little flexibility for variety and changes) was not only *not* a problem, but rather fit in well with the logic prevalent at that historical period, namely, growing, standardized output for a growing, consuming market.

[5] "Toyotism", "Ohnoism", "post-Fordism" and "lean production´"are some of the terms used to describe the Japanese paradigm of flexible industrial production. As Piore & Sabel pointed out, it became clear, especially as of the mid-seventies, that new paradigms of what they called "flexible specialization" had crystallized in the realm of industrial production, paradigms which radically differed from the basic tenets of Taylorism and Fordism. Although Toyotism is not the only example of *flexible specialization* in the world — Piore & Sable showed that pockets of *flexible specialization* appeared in regions of Italy, in some German industries, etc., — I will examine only the Japanese model here. This is partly due to lack of space in the present article for further digressions and partly because the Japanese case was clearly the most encompassing of all, with *flexible specialization* there including a greater percentage of industries and geographical regions of the country (Piore & Sabel 1984).

And what of Toyotism?[6]

Unlike Fordism, which catered to the needs of a mass market (and therefore was based on *economies of scale*), Toyotism appeared after World War II when the Japanese internal market was in a shambles. There was a strong need for a wide range of products, but not every individual article was needed in amounts large enough to provide a regular market in large scale.

Taiichi Ohno, the chief production engineer at Toyota in 1950 had to find a way out of this problem. How to obtain monetary and productivity gains in a restricted market? (Coriat 1991, p. 33). Fordism couldn't give him the answers, because it was based on *economies of scales* (the cheapening of commodities by means of mass production for a mass market). For Ohno, the question was how to realize *economies of scope*, that is, how to improve productivity by producing in *small*, and *diversified* series? (Ohno 1984, p. 199; Coriat 1991, p. 33) It is important to add that the Toyota company's total personnel size had become smaller in the beginning of the 1950's due to the dismissal of workers that followed the company's 1949 financial crisis and the subsequent 1950 strike. This scenario was the background for the appearance of a *flexible* solution which would increase productivity and cut costs even in small-series production.

The essence of Toyotism:

Kan-Ban, Just-in-time, jidoka, zero stock, total quality…

Ohno, impressed by the efficiency of the methods of restocking in American supermarkets, searched for a way to get rid of cumbersome intermediate and final inventory of parts (the ideal of "zero stock") in his industry. He accomplished that by inverting the traditional Fordist arrangement of flow of parts in the assembly lines. Instead of producing a huge amount of products and stockpiling them for when they become necessary or could be sold, the Toyotist factory would now produce *only what had been ordered*.

[6] The following description of the Toyotist paradigm is based on the works by Benjamin Coriat and Taiichi Ohno.

This new system at first creates tension in the assembly line. At any moment one can receive different types of orders and must be ready to adapt to them promptly. Thus, unlike the situation in Fordist factories, the machines and workers *cannot be dedicated to just one task*: they must be *flexible* and *multifunctional*. Whereas under Fordism the worker dedicates himself to one specific task, using usually one specific machine, under Toyotism the worker must be able to operate different machines, often simultanously. This "ohnoist" *modus operandi* is made easier by the high degree of automation of the new electronic machines, which demand from the workers more *overseeing* than *handling*.

Thus, production is now governed directly by *demand*. This is reflected in the communication between workers at the assembly line. Under Toyotism a worker only starts his operation when he receives a *kan-ban* ("signboard") on which the operator next to him (downstream) specifies the items he needs. In the Fordist assembly line the preceding sections (workers) command the rhythm of production and the succeeding sections (workers) have to keep up with it. Under Toyotism, it is the other way around: the succeeding or downstream sections dictate the rhythm of the assembly, since only when they make their "orders" through the *kan-ban* signboards can the upstream or preceding sections start work on the parts. The *kan-ban* boxes go upstream with the "orders" of items and come back *downstream* with the desired items. This strongly diminishes the need for stocks, since production is performed only after direct demand is made. "Zero stock" provides great savings, since inventories mean "idle" money (*i.e.*, advanced but not realized capital). "Zero stock" also has the function of keeping the factory "lean", without an excessive number of employees on the payroll, or employees performing unnecessary tasks.

Another essential change is what Ohno called *jidoka* or *self-regulation* of production (Toyota 1988, p. 143). The workers would thereby have autonomy to stop the assembly line in case of errors or anomalies. This would later be very important for the future Total Quality movement. Under *jidoka* when an error is committed, the assembly line is immediately stopped so that the source of the problem can be found and eradicated once and for all. Unlike the Fordist approach, which views assembly line stoppages as a waste of money to be avoided at all costs, under Toyotism, the money (time) lost while the machines are off is more than compensated by: 1) the fact that it is not necessary to keep an external, separate and costly

Quality Control section because Quality Control is performed *within the assembly line* by the workers themselves, simultaneously with the operation of the machines; 2) once the source of the problem is found it will probably not happen again and only one or few items were affected by it — whereas in the Fordist plant, where quality control is *external to the assembly line* and performed *post-assembly*, a great number of items may be affected before the problem is even detected; 3) the laborers become accustomed to working with greater consciousness of the *quality dimension* of production and, therefore, fewer mistakes are committed.

The active participation of workers is stimulated through their suggestions on how to increase efficiency and reduce costs. The tradition of *lifelong employment* in the large companies in Japan helps create a *cooperative atmosphere* in the firm: the employees are not afraid to give labor-saving suggestions because they know it will not mean their own dismissal in the future. *Lifelong employment* also garantees that the costly investments in training and recycling of employees which the Japanese companies make will not be lost by high labor turnover. Cooperation between management and employees is also facilitated by the fact that trade unions in Japan are often organized along company lines, and not by branches of industry, as in other countries — company trade unionism makes it more difficult for labor from different companies to act together for wider demands.

Thus, we can now list some of the most fundamental differences between Fordism and the new paradigm of Toyotism. In Fordism we have rigid production processes; task specialization; rhythms and procedures imposed (by management, by the conveyor belt, etc.); external (*a posteriori)* quality control; economies of scale (large, standardized series); complete separation between planning and execution; emphasis on vertical, hierarchical flows of communication and command; emphasis on large quantities of products with “sufficiently good” quality. Under Toyotism we find: flexible production (in small and diversified series or lots); economies of scope; multifunctional workers and machines); allocation of modular, variable tasks; quality control simultaneous with production; greater involvement of employees in the organization of production (including the autonomy to stop the assembly line); incentives to horizontal flows of communication; emphasis on Total Quality and cooperation (between workers and

management, between firms and their subcontractors and, at the macroeconomic level, between government and firms).

How can a paradigm based on production in small and diversified series have higher productivity?[7] By the traditional logic of economies of scales this would be much more costly... The answer to this question is in the incredible *flexibility* of the Toyotist factory. Whereas in Fordism the alteration of machines to manufacture different (diversified) products is a costly process in terms of time and effort, the Japanese factory is already laid out so that these alterations can be made quickly and smoothly. Multifunctional machines and machine operators, U-shaped lay-out of the assembly line (with variable, integrated and interchangeable modules or posts), techniques for quick change of tools, etc.; all this eases the alteration of the assembly line for the manufacture of different or alternative items (models) when necessary.

The superior productivity of the Japanese paradigm became apparent with time, gradually. The 1950's were the years of the formation of the system. The 1960's marked its consolidation. As long as the world market was growing (seller's market) and economies of scale were possible and profitable, Toyotism appeared as a kind of alternative model to Fordism, but not intrinsically superior to it. The 1970's, with its oil shocks and the financial crisis that accompanied them, marked the passage from a seller's to a buyer's market worldwide, due to the shrinking of the markets caused by the economic crisis. In a buyer's market the advantages of Toyotism became clear. Competition was sharpened. The manufacturers from the main industrial countries found themselves in the same position as the Japanese after World War II: How to save costs and sell in limited (even shrinking) markets? The Toyotist model was better adapted for these challenges. Witness to this was the avalanche of books seeking to examine and explain the

[7] In 1987, the Massachussets Institute of Technology made a comparative survey between two automaking plants with similar characteristics: the General Motors plant in Framington and the Toyota plant in Takaoka. The Framington plant operated as an example of a tipical ´mass production´ (Fordist) factory; the Takaoka one obviously followed the Toyotist model. Despite the fact that both were considered of ´top-notch´ quality in their own companies, the differences in productivity were striking:

	GM Framington	Toyota Takaoka
Assembly hours per car	40.7	18
Assembly defects per 100 cars	130	45
Assembly space per car	8.1 sq. m.	4.8 sq. m.
Inventories of parts (average)	2 weeks	2 hours

Source: IMVP World Assembly Plant Survey (cited in Womack, Jones & Roo, 1990, p. 83).

secrets of the incredible competitiveness and productivity of the Japanese which appeared in the West from the 1970`s on.

Third technological revolution and the Japanese paradigm

The main point which I want to emphasize here is that, just as the Fordist model was the one which was best adapted to the conditions of the Second Technological Revolution, Toyotism imposed itself as the organizational paradigm which best subsumed the new electronics-based technologies of the Third Industrial Revolution. The rates of utilization of the new electronics-based technologies in the Japanese factories became much greater than in the traditional Fordist plants of the West. This tendency strongly accelerated after 1971, the year of the invention of the microprocessor, which inaugurated the age of microelectronics. Thus, the number of installed industrial robots in the U.SA. and in Japan progressed as follows:

Table 2: Number of industrial robots in the U.S.A. and Japan, selected years.

year 1981- U.S.A.	year 1981- Japan	year 1986- U.S.A.	year 1986- Japan	year 1992- U.S.A.	year 1992- Japan
6,000	21,000	25,000	116,000	47,000	349,458

(Source: UN:ECE/IFR 1995, p. 14)

As for the percentage of machine tools which are equipped with Numerical Control, in 1982 it was already 53.7% in Japan, but in the U.S.A. it was still around 5% (Gregory,1986, p. 317).

We can now turn to what was happening in the Soviet camp during the period of this scientific-technical revolution of the post-World War II decades.

The Soviet system, from its very inception, found itself in competition with capitalist countries. Marxism-Leninism always emphasized that economic superiority (especially in industry) would provide the foundations for the victory of socialism over capitalism on a worldwide scale (Stalin 1946-1951, vol. 13, pp. 183-84; Lenin 1967-1970, vol. 39, p. 21). The USSR was economically inferior to the advanced capitalist countries at the moment of its inception; therefore, it would have to learn the most advanced techniques of the West, in order to master them, adapt them to its own use, and ultimately beat the West economically (Lenin 1967-1970, vol. 36, pp. 189-190). Since Fordism was the most advanced production paradigm in the west at the time of the beginning of the Soviet industrialization drive, this meant that as of the 1930's the USSR was conducting an industrial-economic policy of "catching up with and overtaking" the Fordist model of the advanced capitalist countries. This made the Soviet industrial model absorb many of the central tenets of Fordism — rigid production processes; emphasis on economies of scale in large, standardized series; task specialization; rhythms and procedures imposed "from above" by the administration and by the rhythm of the conveyor belt; separation between planning and execution, etc. —, incorporating them into the industrial system (within the larger framework of a society in transition to socialism). This absorption was made easier by the fact that these main *economic* tenets of Fordism fit in rather well with the *political* objectives of the Stalinist system at the time of the industrialization drive. Both Fordism and the Soviet system were *rigid*, based on *vertical*, top-down flows of communication/orders and emphasized large *quantities* (mass production/responses). Within these parameters the Soviet system was playing well according to the rules of the game.

This process of adoption of Fordist-Taylorist methods by the USSR can be clearly followed in the official literature. In the famous 1918 article *The Immediate Tasks of the Soviet Government* Lenin himself wrote: "The task that the Soviet government must set the people in all its scope is — learn to

work. The Taylor system, the last word of capitalism in this respect […] We must organize in Russia the study and teaching of the Taylor system and systematically try it out and adapt it to our ends" (Lenin, 1967-1970, vol. 36, p. 189-190). And the Soviet government acted upon it by founding the *Nauchnaya Organizatsiya Truda* (NOT, "Scientific Organization of Labor") movement in which time and motion efficiency studies were conducted along Taylorist lines. The introduction of Fordism proper was implemented not only by studying the phenomenon at a distance, but with the help of western companies themselves, especially in the 1930´s. Not unrelated to the economic depression in the capitalist countries at that time — which made the growing economy of the communist country an alternative for business — technical assistance agreements were reached so that western companies sent expertise and personnel to the USSR. The best example was given by the Ford Motor Company itself. Ford supplied the expertise (and some personnel) to help build the 1932-inaugurated Gorky Automobile Motor Company which made the Gaz-A car and the Gaz-AA truck (the Soviet versions of the American Ford A-model car and AA truck). And this was not an isolated instance. Similar contracts were signed with other western companies, such as the Austin Company, the Tinken-Detroit Axle Company and the Brown Lipe Gear Company (Sutton 1971, p. 1; Hardt & Holliday 1977, p. 194). Soviet authors like Shmelev & Popov and Mertts *et al.* give detailed description how Fordism was introduced in the USSR and how it worked in practice in Soviet factories (Mertts *et al.* 1932; Shmelev & Popov 1989).

As long as the Fordist model was dominant in the world economy (up to the 1950's and part of the 1960's), the Soviet strategy of "copying" (or absorbing) it in order to "catch up and overtake" proved fruitful in general macroeconomic (and military) terms. In the 1930's, 1940's and 1950's the official average peacetime growth rates of the Soviet economy were above 10% a year. The economy of the Soviet Union was growing by rates more than three times higher than those of the U.S.A., for example. When in 1961 Khrushchev famously declared that in twenty years the USSR would overtake the United States economically, it then did not seem so far-fetched as it does today in retrospect (Kommunisticheskaya Partiya Sovetskogo Soyuza 1986, p. 130). If both countries continued to grow at the same rates prevalent then, the GDP of the USSR would have surpassed that of the U.S.A. in less than

twenty years! The problem is that the Soviet economy did not continue to grow at the same rates in the following decades…

In the sixties and the seventies, when new paradigms of *flexible specialization* (especially toyotism) came into their own and started proving themselves more productive and efficient, the maintenance of a Soviet industrial system based on Fordist principles started to be counterproductive. The official Soviet yearly average economic growth rates fell to 7.2% in the 1960's, then to 5.7% between 1970 and 1975. After 1975 up to the beginning of perestroika, the yearly growth rates were basically under 5%. These falling rates are inversely proportional to the success of Toyotism in overcoming Fordism as the most advanced (productive) industrial paradigm in the world economy. The mid-1970's — when the STR as defined here reached completion with the inauguration of microelectronics and of the information revolution — marked not only the clear superiority of Toyotism in relation to traditional Fordism, but also the period when there were strong indications that the Soviet model was becoming inappropriate for the demands of the era of the information revolution. In the 1970's and the 1980's, the most advanced parts of the world economy were increasingly turning towards new paradigms which emphasized *flexibility*, *quality* and *more horizontal flows of communication/command* in production. The Soviet Union, due to the historical formation of its model (based on hierarchical, *vertical* flows of command and control, *rigid* production methods, emphasis on *quantity* over quality, etc.) proved unable to adapt to these new developments without upsetting the very socio-economic-political foundations of its regime. Therefore, perestroika (especially its initiation) needs to be seen not merely as an intrasystemic process of the Soviet Union, but as a series of phenomena connected to larger processes (*i.e.*, the whole scientific-technical revolution) which were (and are) going on worldwide and which bore their influence on the way Soviet leaders had to plan their policies and strategies. Although perestroika was an attempt to make the Soviet economic (and political) system more flexible, with more horizontal flows of information

and command and with more emphasis on quality, the rigid, top-down Soviet regime proved unable to complete this passage without losing its original socialist identity.[8]

Words of caution au lieu of conclusion

The above explanation should not be read as economic determinism of the type "the Soviet Union could not adopt Toyotism and therefore was doomed to collapse". This would be a grossly simplistic reading of the situation. My explanation meant to just show why it was so difficult for the Soviet Union to

[8] It is interesting to note that perestroika was not the first attempt to seriously change the Soviet paradigm to a more flexible, "horizontal" and quality-oriented approach. In the mid-1960´s (prime-minister) Kosygin´s reforms boldly attempted to make Soviet planning and management less rigid, with more autonomy given to the firms and a focus away from the indicator of *valovaya produktsiya* (gross production) into quality concerns. In retrospect we know that the Kosygin reforms died out a few years later, as the autonomy given to firms and regional organizations increasingly clashed with the need of the Soviet center to keep control of the whole process. However, they demonstrated that the Soviets were aware of the changes in the world paradigms of production. In the process of researching this theme I came across an old Soviet industrial manual by Omarov *et al.* dated from 1964 which showed that the Russians were well aware of the new flexible Toyotist production paradigm *and even made experiments with it inside the USSR as early as the 1960´s*. It is worth describing some parts of this manual which introduced concepts like "Total Quality" and "zero-defect production" to the Soviet industrial establishment. For example, when discussing the question of quality control in production Omarov *et al* suggested that, instead of utilizing the usual (Fordist) approach of having *a posteriori* quality control via the traditional OTK (*Otdel Tekhnicheskogo Kontrolya*, the Soviet term for the quality control department or section), the production line should "check and control not so much the finished articles per se but rather the technological processes and equipments [… in order to] to avoid defects before they can happen […]" (Omarov *et al*. 1964, pp. 105-106). This is one of the pillars of Toyotist Total Quality Control, that is, prevent errors from happening (or from happening again) before they affect many items in the production line at stages that in a Fordist line antecede the final quality control section. Omarov *et al*. wrote that the goal is to reach *bezdefektnoe izgotovlenie produktsii* ("production without defects" or, in Toyotist parlance, "zero-defect production") (*ibid.*, p. 109). This objective should be reached by means of what Omarov *et al*. described as *samokontrol´*, i.e., quality control implemented during the production process by the workers themselves (*ibid.*, p. 111). Quality control simultaneous with production by workers themselves (instead of the *a posteriori* Fordist quality control) is a central Toyotist feature which in Japan, as we noted earlier, is called *jidoka*.

What surprised me the most was that Omarov *et al.* went on to describe the fact that the Soviets were experimenting *in practice* with these Toyotist techniques of *bezdefektnoe izgotovlenie produktsii* and *samokontrol´* at the time of their publication "in more than fifty factories of the Volga *sovnarkhoz*" (*ibid.,* p. 109*)*. Soviet factories experimenting with Toyotist techniques in the mid-1960´s! What a sight! Knowing in retrospect that no Toyotist model got hold of the Soviet production system after that, we may infer that these experiments met the same fate as many of the economic experiments with limited number of companies in the USSR before perestroika (including the famous Andropov experiments). The experiments sometimes even yielded good results in the selected companies. This is because these companies, due to the fact that they take part in the experiment, often received preferential treatment in the notoriously bureaucratic Soviet supply system. But, by definition, priority cannot be given to all… It is when they tried to generalize what went right in the controlled experiments to all factories in the USSR that the problems arose. For example, we could even imagine experiments with the just-in-time system being made in selected Soviet companies. It might work if they received priority in the supply system (as some factories in the military complex did). But it would be hard to imagine just-in-time being generalized to all factories in the USSR! Had it been achieved then the Soviet system would have proved able to adapt itself to the new times of flexible specialization. Maybe the fate of this experiment with Toyotist techniques in "more than fifty companies of the Volga sovnarkhoz" described by Omarov *et al.* is an illustration of the difficulties encountered by the rigid Soviet system to adapt to these new times.

perform well or to economically adapt itself to the new times of the paradigms of flexible specialization. But that does not mean that this adaptation was *a priori* impossible. Many other factors (and not only economic factors) are involved in social life ("It is *not only* the economy, stupid!"); that makes the situation more complicated and, at the same time, more open-ended. Could Gorbachev guide a communist regime like that of the Soviet Union towards a more flexible system instead of being *a priori* condemned to failure? We do not need to have recourse to contra-factual history to answer this. Ironically, the country (regime, system) that outperformed all others in the present times of this technological age is… a communist country! China, with its "cumbersome", "meddlesome" state and communist party is growing economically at outstandingly high rates, with most of its large factories churning out products within the present paradigms of flexible specialization. Of course endless debates are possible here ("Is China a socialist or a capitalist country?", "China never had such a rigid central planning as the USSR", etc.), but the point I want to make is that my explanation of one of the central problems of the USSR should not be taken as predetermination. In my opinion, a much more interesting question to ask would not be "could Gorbachev adapt the Soviet economy to the new flexibility-oriented times?" but rather "Could Gorbachev do that *in a democratic way*?". China proved that, by (temporarily?) isolating politics from the economy (economic liberalization, political authoritarianism), it could made the breakthrough to the new technological age. Could this have been done, however, together with a political opening? This is the really difficult question in my opinion and one that I, again, deem open-ended. I believe Gorbachev failed in his initial project of reforming socialism in the USSR not only because of the economic constraints (including the central one I expounded), but also because other factors (for instance, the previous alienation of the population engendered by the way the authoritarian system *politically* functioned) made it difficult for Gorbachev to count on popular support for real reform movement *within* the confines of socialism. His task to change the economic system was already extremely difficult due to the structural factors I expounded above and it was made more difficult by all these other factors (including non-economic ones) surrounding it.

Finally, the decline (and end) of the USSR, also ironically, should not be deemed a victory of the west, as it is sometimes regarded. Not only because of the above contradiction that at present a country from the east (China) is taking the lead worldwide, but also because Fordism was defeated by a paradigm from the east (Toyotism from Japan). In the 1970´s and 1980´s, not only Soviet Fordism was struggling, but most Fordist factories from western countries were having a hard time coping with the competition from the Toyotist factories in Japan too. Who doesn´t remember the stream of books at that time predicting the "fall of the American empire" or "the Rise of Japan"? By the way, the fact that from the 1990´s on Japan went into a stagnation mode and western factories came back up in the competition with that country does not undermine the power of the new flexible Toyotist paradigm. The western factories recovered in the 1990´s by learning the new flexible techniques (becoming "toyotist", if you wish) and beating Japan and the actual Toyota company at their own game. This way, the "defeat" of the Toyota company and other Toyotist Japanese companies meant the victory of Toyotism (as western competitors imitated and absorbed this paradigm), just like the "defeat" (falling behind) of the Ford Motor Company later on in the mid-20th century meant the victory of Fordism (as the other car companies adopted this method to beat Ford himself).

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