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Investment Mobilization and Capacity Completion in the Chinese and Soviet Economies

*Mark Harrison**

Abstract

This paper examines the relationship between the mobilization of resources into capital projects and the completion of new productive capacity in two 'shortage' economies — China and the USSR. Causes of delayed commissioning of new capacity, and the role of unfinished construction in the investment cycle, are analysed. Annual data over a long period are presented for both economies — for the USSR 1928–37 and 1950–83, and for China 1950–82. Changes over time in the relationship between investment mobilization and capacity completion are considered, along with differences and similarities between the records of the two economies under investigation.

The investment cycle in shortage economies

A 'shortage' economy is one that is supply-constrained, that is, at all levels of the economic system there is pressure to mobilize resources and add to existing capacity. 'Shortage' applies first and foremost to fixed capacity and new investment goods, and then to goods in general via the derived demand for wage goods. As Soviet experience has indicated, shortage economies tend in the long run to generate labour shortage too, but their short run ability to generate full employment is sometimes constrained by the shortage of fixed capacity. The most populous 'shortage' economy, China, has remained labour-abundant for this reason.

Under what conditions does a 'shortage' economy appear? At higher levels industrial and political leaders formulate ambitious plans and stress the rapid increases in production which such plans require. Among lower-level managers there is a matching tendency to express a high demand for investible resources. Among the motives for the expansion drive at lower levels are the security derived from the acquisition of incremental capacity in the face of high-level demands, and the gains associated with successful productive and organizational expansion. At every level the ability to add to output is rewarded, while the penalties for adding to output in ways which detract from the surplus of social revenue over social costs are slight.[1]

Under these circumstances the *ex ante* demand for investible resources has an almost 'unlimited' character, and the resulting investment drive may suffer from a perceived lack of 'discipline'. By following the investment process we can list the main features which result.

First of all, since investment as an activity is rewarded and inappropriate investment is not penalized, claims on investible resources from lower levels are unremitting, and

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[1] For the underlying approach see Kornai, 1980, pp. 191–5.

normally exceed higher level investment allocations by a substantial proportion.[2] This pressure from below is to a large extent independent of the atmosphere generated by the pronouncements and directives of high-level bosses. When mobilization is in the air, everyone is encouraged to think of new and striking ways of adding to capacity. But when national leaders sound a cautious note, those below them are not duly discouraged, because the changed atmosphere does not alter the imbalance of rewards and penalties attached to investment. Thus a downvaluing of centrally determined investment plans only steps up the battle of the central authorities to limit the effectiveness of demands upon them emanating from lower levels.

Secondly, for the same reasons, those in charge of project design and evaluation are strongly motivated to underestimate costs and speed of completion and to overestimate returns. The more promised by a given project at the design stage, the more likely it is to receive the stamp of approval from higher levels. Of course, higher level authorities wish only to authorize projects which will be rapidly and cheaply completed and which, after completion, will yield a high level of surplus for many years. But this desire is ineffective, since it only encourages distortion in the process of information, evaluation and decision. Moreover, distorted information and evaluation go unpunished, since the distortion is revealed only after the project is initiated; by this stage too many people and institutions are committed for decisions to be reversed or commissions of inquiry to be launched (and besides, the underlying behaviours are 'normal' and expected). Eventually, the costs of overoptimism will be borne by the economy as a whole, not by those formally responsible.

Thirdly, as a result of the overoptimism which permeates the decision making process, the higher levels in charge of approving projects and rationing funds do not succeed in balancing the demand for investible resources against the economy's ability to supply them. Even if only those projects are initiated which have been centrally approved, it will turn out after the event that the input requirements of all the projects under construction at a given moment will be far greater than forecast, and the cumulative sum of commitments of labour, machinery and industrial materials to both current production and to building sites under construction will exceed aggregate supply.[3] In addition, more projects may have been actually initiated than were centrally authorized, since those disappointed in their claims on centrally allocated investment funds may divert funds allocated to them for other purposes to finance projects for incremental capacity.[4] Again, the imbalance of rewards and penalties ensures that such rule-breaking will be sanctioned after the event, while diverted funds are made up from the central budget.

Fourthly, decentralization of decisions in the investment process subject only to financial controls will yield the same result, as long as the financial controls are weaker than the pressure to realize a high level of gross output.[5] Thus, the enterprise may be free to make its own decisions about incremental capacity, subject only to the availability of internal funds and external credit, coupled with incentives to meet centrally specified criteria of effectiveness such as a rate of recoupment or return. Taken in isolation, such rules imply a shift of emphasis from expansion drive at all costs to maximization of the surplus of revenues over costs. But if the penalties for inappropriate investment remain weak, if the central authorities remain willing to make up losses arising from inappropriate investment in order to finance output expansion and if the rewards and penalties associated with output targets remain relatively powerful, an imbalance in the number of projects over the economy's ability to supply them will still tend to emerge.

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[2]E.g. Dyker, 1983, p. 36.

[3]E.g. Dong, 1982, p. 58; Dyker, 1983, pp. 37–8.

[4]Hutchings, 1982, p. 195.

[5]This may have been the situation in the Hungarian economy before 1952 and after 1968, and of the Chinese economy in 1979–80; see Kornai, 1980, pp. 207, 210; Reynolds, 1982, p. 129.

Fifthly, in the process of realizing the investment plans of the various levels of decision makers, shortfalls will emerge in the supply of inputs into the investment process which mean that not all projects can be supplied at once. This situation demands intervention by the central authorities; central plans must be supplemented by directives which tend to modify or override them; or, where *ex ante* investment decisions have been decentralized to enterprises, there is a tendency to restore central decision making powers. Administrative priorities must be defined, ranking existing projects in order of their importance in meeting future output targets; these priorities can be used to steer inputs towards key priorities and to ensure that only low-ranking projects are cut off from new resources. But because the extent of shortage is unforeseen and there is insufficient time to calculate all the repercussions of emergency action, the rationing of inputs cannot avoid an accidental character, so that not all priorities will be satisfied, and even key projects may be cut off.

Sixthly, in face of the growing shortage of cement, structural steel, timber, lifting and digging machinery, transport services, fuel and power, industrial equipment, building workers, housing facilities and so on, there is a strong temptation at all levels to respond by initiating new capital projects to widen these current bottlenecks in the future. The sectors of the economy producing deficit commodities may be said to have fallen behind; rather than accommodating the state of shortage, the economy must devote new resources to eliminating it by extending still further the front of investment mobilization.[6] This temptation may be effective not only at the centre of the economy, but also at lower levels — among existing enterprises and construction organizations, which may attempt to create new auxiliary enterprises to supply investment goods and substitute them for those which the rest of the economy is no longer able to supply.[7] Needless to say, such reactions are likely to increase the imbalance of investment demand over supply and intensify the state of shortage.

These tendencies do not manifest themselves continuously and in the same proportion. More likely is a cyclical movement in the process. There is a period of expansion drive, in which resources are mobilized, new capacity commissioned, and rapid economic growth is realized. But eventually the mobilization goes too far. The first sign of excessive mobilization is the growing number of idle building sites where building materials and equipment have ceased to be delivered, fuels are scarce so that machinery cannot operate, and even the workers may not receive their rations. Associated with this is the unwarranted lengthening of the average gestation period for capital projects. New investment is still being carried out, but while new projects are being initiated existing ones are not finished off. Thus, investment increasingly means investment in unfinished capacity, while there is a slowdown in the rate of commissioning of new capacity. Beyond a point, the attempt to press on with existing investment plans will not only bring the expansion of finished capacity to a halt, but will also begin to damage current output — for every ton of steel and fuel delivered to an immobilized investment project, somewhere else an existing factory will be forced to slow down its operations and contract its production. Investment will begin to fall, and the whole economy may falter.

The only thing that can resolve this crisis is decisive action from the centre. The initiation of new capital projects must be altogether prohibited. Building sites still far from completion must be mothballed, regardless of priority. Scarce investment resources must be concentrated on those projects which are within a few months or a year of completion — and only on them.[8] With the cutback in investment plans, the constraints may now begin to relax. Over the coming period, new capacity will be commissioned and the backlog of

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[6]E.g. Harrison, 1985, pp. 9–10.

[7]E.g. Dyker, 1983, pp. 38–9; Harrison, 1985, pp. 204–9. In China, local and plant self reliance became leading principles of the Maoist economic system.

[8]Bajt, 1977, pp. 60–1 analyses this step as a forced adjustment by the planners to the high rate of time preference of the population.

frozen projects reduced. Output can grow again, so that the downturn in investment can be reversed. Economic growth is resumed, and the conditions for a new investment mobilization gradually laid down.

In this simplified picture of the investment cycle, unfinished capacity plays an important role as a sensitive indicator of the effectiveness of investment. It provides the warning sign of over-investment, and the focus for emergency action to resolve the over-investment crisis.

At the same time, the reader should understand that unfinished capacity is not the only important indicator of the efficiency of investment. In the broadest sense, the efficiency of investment must be measured as a rate of return on new assets. Whether new assets take the form of finished, operational capacity or of unfinished construction is only one of the determinants of their rate of return, since even completed capacity may not necessarily add to the surplus of social revenues over social costs. Thus, the behaviour of unfinished capacity only tells us about one side of investment efficiency although this aspect is, in my view, very important.

The reader should also understand that this description of the investment process in shortage economies has some application beyond Chinese and Soviet frontiers. Most socialist economies are run on 'shortage' lines, although a few are not, and there are indications that China today is moving away from shortage. Most capitalist economies are demand-constrained and show a periodic tendency to underutilization and mass unemployment; but shortage conditions have quickly emerged under conditions of protracted warfare. Thus, wartime Britain displayed many of the same features of the investment process as peacetime shortage economies under socialism.[9]

Unfinished capacity: behaviour and measurement

Unfinished capacity is a normal aspect of a growing economy. Under steady-state expansion of an economy with fixed assets, unfinished construction will be present and will expand through time. Without it, the conditions would not be created for adding to finished capacity at an increasing rate in the future. For the expansion of unfinished capacity to signal a state of overinvestment, it must be in some sense disproportionate.

Analysis of a steady-state economic growth does not cast direct light upon the progress of the Chinese or Soviet economies, the economic growth of which has been far from steady. However, it can perform two useful functions for us. Firstly, it may help us define useful measures of proportionality in the investment process against which the disproportionality of observed investment behaviour may be assessed. Secondly, it may show us how these measures are affected by long term parameters such as the underlying construction period of large projects, or the underlying expansion path of the economy, so that short term disturbances can be more easily picked out.

Under steady-state expansion, what determines the volume and proportions of unfinished capacity at a given moment? The two basic influences are the gestation period of the typical project, and the rate of growth of the number of new starts. Let us begin by defining:

I_t net investment in period t

ΔC_t new capacity completed in period t

n number of periods required for completion of the representative project

r rate of growth per period in the number of new starts

[9]Robinson, 1951, p. 42. Hutchings, 1982, p. 195 goes further in identifying points of similarity of investment behaviour between 'dynamic socialism and dynamic capitalism'.

Assume that in period t = 0 the value of new starts is equal to one, and that expenditure on each project is spread evenly over the n periods of its gestation. Note that under steady-state conditions r gives the growth rates not only of the number of new starts but also of investment, of the capital stock and of total output.

In period t the volume of investment is equal to the value of new starts together with current commitments to unfinished projects begun in previous periods, i.e.

$$I_t = (1 + r)^t + (1 + r)^{t-1} + \ldots + (1 + r)^{t-n+1}$$

$$= \sum_i (1 + r)^{t-1}, i = 0, \ldots, n-1$$

In the same period the value of newly completed capacity is given by the accumulated value of projects begun n periods before, i.e.

$$\Delta C_t = n(1 + r)^{t-n+1}$$

There is then a steady-state proportion $\bar{c}_t$ betweeen ΔC_t and I_t which we shall call the investment completion rate, given as:

$$\bar{c}_t = \frac{n(1 + r)^{t-n+1}}{\sum_i (1 + r)^{t-i}}, i = 0, \ldots, n-1$$

This is also the proportion in which newly available investment goods are allocated to finishing off projects and commissioning new capacity, rather than to starting new projects and continuing projects far from completion. So there is also a corresponding rate of unfinished capacity $\bar{u}_t$ which is defined as $1 - \bar{c}_t$, that is, the proportion of new investment which is allocated to the increase in unfinished capacity.

Likely values of the completion rate under steady-state expansion of the economy are illustrated in Table 1. The table shows that when gestation lags are short the completion rate is high and is also insensitive to the rate of growth of investment. But as gestation lags lengthen the completion rate tends to fall; with longer gestation periods, a higher growth rate of investment implies a larger and larger commitment of new investment resources to adding to unfinished capacity.

Is the investment completion rate (or its complement, the rate of unfinished capacity) an accepted indicator of proportionality in the investment process? Here official Soviet and Chinese practices differ. The current Chinese statistical yearbook gives annual series for

TABLE 1. The investment completion rate ($\bar{c}_t$), per cent, under steady-state economic growth

Gestation period (n) of the representative project	Rate of growth of new starts (r), per cent per period					
	0	5	10	15	20	25
1	100	100	100	100	100	100
2	100	98	95	93	91	89
3	100	95	91	86	82	79
4	100	93	86	80	75	69
5	100	90	82	74	67	61

fixed investment and new capacity for the period 1950–82, and a percentage 'rate of fixed assets turned over to use' — the completion rate as defined above. From here the rate of unfinished capacity and the value of additions to unfinished capacity in each year can be obtained directly.

The picture obtained from Soviet official statistics is more complicated. Since 1962 the Soviet statistical yearbook has included an annual series (backdated to 1950) for the cumulative value of total unfinished capacity at the end of each year, together with the same as a percentage of investment in each year. Let us call this percentage $\bar{s}_t$ the Soviet rate of total unfinished capacity. Under the conditions of steady-state expansion $\bar{s}_t$ can be shown to equal $1 - \bar{c}_t/n$; this term lacks an intuitive interpretation, but variations in it are interpretable. However, in the absence of steady-state conditions, the Soviet rate of total unfinished capacity loses any close connection with the completion rate, and may not vary inversely with the latter. For analytical purposes, therefore, the Soviet concept is rejected in favour of the investment completion rate defined earlier.[10]

Another possible index of capacity completion is the rate of new additions to fixed capacity in proportion not to current investment, but to the total accumulated backlog of unfinished capacity — the rate at which unfinished capacity is finished off. We could define a 'backlog completion rate', b_t (in distinction from the investment completion rate, $\bar{c}_t$) as ΔC_t divided by UC_t, the stock of unfinished capacity at the beginning of period t. This is a more meaningful measure than the Soviet rate of total unfinished capacity — more useful, however, for the long run than the short. In the short run, movements in backlog completion should lag behind investment completion, and the latter should more accurately reflect the investment cycle. At the peak backlog completion will go on rising after investment completion has begun to fall, because current investment is still large relative to the unfinished backlog. In the downturn backlog completion will go on falling after investment completion has begun to improve, because now the unfinished backlog is bigger and current investment has been reined back. But in the long run backlog completion may throw additional light on investment efficiency (for empirical comparisons see the Appendix).

The foregoing assumes that it is possible to measure unambiguously the volumes of net investment, of additions to unfinished capacity and newly commissioned capacity through time. In reality such measurements are beset with well-known difficulties. Historic-cost valuation of the changing stock of assets, finished or otherwise, is subject to distortion arising from the changing price level of investment goods in general, changes in their prices relative to each other, the difficulty of measuring the rate of retirement of existing assets through depreciation, and of measuring the rate of obsolescence of existing assets and the valuation of the new assets substituted for them. The constantly changing standard of values makes changes in the stock of assets valued at historic cost hard to interpret. However, such problems need not obscure measurement of the proportionality of the investment process since in estimating the completion rate (or rate of unfinished capacity) the additions to unfinished capacity at current values may be divided by the current value of investment, thus eliminating the effect of changes in the value standard set by investment good prices.

Chinese data for investment and capacity completion (1950–82) are shown in Table 2, columns i and ii. They appear to be based on historic cost and current prices. They are used to calculate the rate of unfinished capacity (column iii) and the increase in unfinished capacity (column iv) in each year.

For the Soviet economy in the interwar period (1928–40) available data are shown in Table 3 (after 1937 the data are fragmentary). Unfinished capacity, for which there are two overlapping but inconsistent series, is measured at historic costs (columns i and ii).

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[10]Occasional use is made, however, of the completion rate in Soviet scholarly works; see, for example, ISE, 1978, p. 247.

TABLE 2. Investment and unfinished capacity in China 1950–82

Year	State investment in capital construction, Rmb billion at current prices	Completion rate per cent	Rate of unfinished capacity per cent	Increase in unfinished capacity Rmb billion (i) × (iii)	Year	State investment in capital construction, Rmb billion at current prices	Completion rate per cent	Rate of unfinished capacity per cent 100 − (ii)	Increase in unfinished capacity Rmb billion (i) × (iii)
	(i)	(ii)	(iii)	(iv)		(i)	(ii)	(iii)	(iv)
1950	1.13	89.0	11.0	0.12	1966	25.48	70.4	29.6	7.54
					1967	18.77	50.6	49.4	9.27
1951	2.35	75.8	24.2	0.57	1968	15.16	45.9	54.1	8.20
1952	4.36	71.5	28.5	1.24	1969	24.69	52.7	47.3	11.68
1953	9.16	82.0	18.0	1.65	1970	36.81	65.3	34.7	12.77
1954	10.27	81.3	18.7	1.92					
1955	10.52	86.2	13.8	1.45	1971	41.73	54.4	45.6	19.03
					1972	41.28	55.7	44.3	18.29
1956	16.08	75.4	24.6	3.96	1973	43.81	68.7	31.3	13.71
1957	15.12	93.4	6.6	1.00	1974	46.32	63.4	36.6	16.95
1958	27.91	74.8	25.2	7.03	1975	54.49	63.9	36.1	19.67
1959	36.80	69.2	30.8	11.33					
1960	41.66	68.8	31.2	13.00	1976	52.39	58.9	41.1	21.53
					1977	54.83	71.4	28.6	15.68
1961	15.61	74.5	25.5	3.98	1978	66.87	74.3	25.7	17.19
1962	8.73	79.0	21.0	1.83	1979	69.94	83.7	16.3	11.40
1963	11.67	81.9	18.1	2.11	1980	74.59	79.1	20.9	15.59
1964	16.59	82.8	17.2	2.85					
1965	21.69	93.6	6.4	1.39	1981	66.75	86.6	13.4	8.94
					1982	84.53	74.4	25.6	21.64

Source: State investment and completion rates from SYC, 1983, pp. 323, 343.

TABLE 3. Investment and unfinished capacity in the USSR 1928–40

Year	Stock of unfinished capacity at historic cost on 1 January, billion roubles		Gross investment, billion current roubles	Increase in unfinished capacity, billion roubles from (i, ii)		Rate of unfinished capacity, per cent (iv, v) – (iii)	State investment, billion 1955 roubles	Increase in unfinished capacity, billion 1955 roubles (vi, vii) × (viii)	
	Series A	Series B		Series A	Series B			Series A	Series B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
1928	1.38		4.95	0.66		13.3	0.83	0.11	
1929	2.04		6.40	0.92		14.4	(0.84)	(0.12)	
1930	2.96		9.26	1.68		18.1	1.39	0.25	
1931	4.64		14.16	3.20		22.6	2.02	0.46	
1932	7.84		17.79	4.13		23.2	2.35	0.55	
1933	11.97	11.32	15.59	0.88	0.83	5.6/ 5.3	1.94	0.11	0.10
1934	12.85	12.16	20.27	1.78	2.83	8.8/14.0	2.55	0.22	0.36
1935	14.63	14.99	25.06	−0.85	−0.51	−3.4/−2.0	2.98	−0.10	−0.06
1936	13.78	14.48	34.23	0.44	5.38	1.3/15.7	4.07	0.05	0.64
1937	14.22	19.86	32.51	2.18	5.32	6.7/15.5	3.62	0.24	0.56
1938	16.40	25.18			3.95		3.81		
1939		29.14			2.32		4.43		
1940		31.45				(13.5)	4.73		(0.64)

Notes: Series A and B are obtained from different sources and the reasons for the discrepancy are not clear. State investment in 1929 is estimated from state centralized investment by a 5 per cent allowance for decentralized investment. The rate of unfinished capacity given for 1940 does not strictly belong to Series B but is obtained from an independent source.

Sources: Unfinished capacity and investment at current prices from Davies, 1984, pp. 177–8; state investment at constant prices from Clarke, 1972, p. 12. The rate of unfinished capacity for 1940 is given in Harrison, 1985, p. 134.

investment at current prices is also shown (column iii). When the increase in unfinished capacity at current prices in each year (columns iv and v) is compared with investment at current prices, we obtain the rate of unfinished capacity (column vi). By combining the rate of unfinished capacity with an official series for investment at constant 1955 prices (column vii) we can also obtain estimates of the increase in unfinished capacity as if in real terms (columns viii and ix). But for analytical purposes below, we will stick to the original data in current values, since the adjustment to 1955 roubles hardly affects their behaviour.

Postwar Soviet data, shown in Table 4, present more complex problems. Unfinished capacity (column i) is measured at historic cost. The Soviet rate of total unfinished capacity ($\overline{s}_t$), obtained by dividing column i into some unspecified investment series, is shown in column ii. What is the investment aggregate used? We can obtain the implied series by dividing the Soviet rate of total unfinished capacity into the unfinished capacity series. The result (column iii) moves closely with official series for state investment at constant prices (columns iv-vi). But the constant prices are not the same constant prices throughout. From 1950 to 1968 the investment series used to calculate the Soviet rate of total unfinished capacity follows state investment at 1955 prices. From 1970 to 1975 it follows state investment at 1967 prices; for the intervening year of 1969 an average of 1955 and 1967 prices has evidently been employed. From 1976 to 1983 state investment at 1975 prices is followed.

In summary, the Soviet rate of total unfinished capacity shown in Table 4, column ii, may rise or fall for four independent reasons: (a) because of a change in the proportionality of the investment process; (b) because, as we found above, it is a badly formulated index only tenuously related to investment proportionality; (c) because unfinished capacity is measured at historic values whereas investment is measured in real volumes, and (d) because the constant prices used to measure investment volumes are changed arbitrarily from time to time without appropriate deflation of data for adjacent years. To take the latter case alone, if Soviet statisticians had not made the unacknowledged transition from 1955 to 1967 values in measuring investment in 1969 and 1970, by the latter year the Soviet rate of total unfinished capacity would have stood at 83 per cent, not the 73 per cent officially recorded.

In subsequent analysis we seek to mitigate these problems in the following ways. Firstly, we discard the data in Table 4, columns ii and iii, and use column i instead to generate a series for the increase in unfinished capacity in each year at current values (column vii). This is divided into the official series for state investment at 1955, 1967 and 1975 prices (columns iv-vi) to yield three overlapping series for the rate of unfinished capacity (column viii). In interpreting year-to-year fluctuations we can probably ignore the discrepancy between current-value unfinished capacity and constant-price investment, but we must bear this in mind in interpreting the level and time-trend of the rate of unfinished capacity measured in this way. The use of three overlapping series will draw our attention to the problem and indicate its extent.

I have made no attempt to substitute independent estimates for Soviet official data, for two reasons. Firstly, use of official data allows us to maintain statistical comparability, where resorting to independent estimates would multiply both workload and the risk of errors in data processing and interpretation. Secondly, the main divergences between Soviet data and independent time series concern long run trends rather than annual fluctuations. Since our main focus falls on the latter, resorting to independent estimates would not greatly alter the picture.

The Chinese record

Figure 1 graphs Chinese data for state investment and the increase in unfinished capacity. Figure 2 shows the resulting rate of unfinished capacity (the share of investment devoted to increasing the volume of unfinished construction) in comparison with two major performance indicators — the annual growth rates of state investment and of national

TABLE 4. Investment and unfinished capacity in the USSR 1950–83

Year	Stock of unfinished capacity at historic cost, end of year		Investment, billion roubles (i) ÷ (ii)	State investment, billion roubles			Increase in unfinished capacity, billion roubles from (i)	Rate of unfinished capacity, per cent (vii) ÷ (iv, v, vi)
	billion roubles	as per cent share of investment		at 1955 prices	at 1967 prices	at 1975 prices		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
1950	8.7	85	10.24	9.4			—	—
1951	10.2	91	11.21	10.6			1.5	14.1
1952	11.7	95	12.32	11.9			1.5	12.6
1953	12.9	101	12.77	12.5			1.2	9.6
1954	14.1	94	15.00	14.6			1.2	8.2
1955	15.0	92	16.30	16.1			0.9	5.6
1956	16.0	85	18.82	18.6			1.0	5.4
1957	17.6	83	21.20	21.1			1.6	7.6
1958	17.5	73	23.97	23.9			−0.1	−0.4
1959	19.0	70	27.14	26.7			1.5	5.6
1960	21.4	69	31.01	30.0			2.4	8.0
1961	24.8	76	32.63	31.9			3.4	10.7
1962	26.1	76	34.34	34.0			1.3	3.8

TABLE 4. *Continued.*

Year	Stock of unfinished capacity at historic cost, end of year		Investment, billion roubles (i) ÷ (ii)	State investment, billion roubles			Increase in unfinished capacity, billion roubles from (i)	Rate of unfinished capacity, per cent (vii) ÷ (iv, v, vi)
	billion roubles	as per cent share of investment		at 1955 prices	at 1967 prices	at 1975 prices		
1963	26.2	72	36.39	36.1			0.1	0.3
1964	27.1	68	39.85	39.4			0.9	2.3
1965	29.6	69	42.90	42.7			2.5	5.9
1966	32.5	71	45.77	45.8	53.7		2.9	6.3 / 5.4
1967	35.8	72	49.72	49.4	58.0		3.3	6.7/ 5.7
1968	41.8	77	54.29	53.5	62.5		6.0	11.2/ 9.6
1969	48.6	80	60.75	55.8	65.1		6.8	12.2/10.4
1970	52.5	73	71.92		72.7	71.4	3.9	5.4/5.5
1971	57.9	74	78.24		78.1		5.4	6.9
1972	65.2	78	83.59		83.8		7.3	8.7
1973	67.1	77	87.14		87.4		1.9	2.2
1974	71.7	77	93.12		93.8		4.6	4.9
1975	76.7	75	102.27		102.3	100.4	5.0	4.9/5.0
1976	84.1	80	105.13			105.3	7.4	7.0
1977	92.5	85	108.82			109.3	8.4	7.7
1978	99.0	85	116.47			116.4	6.5	5.6
1979	106.4	91	116.92			117.1	7.4	6.3
1980	105.1	87	120.80			120.2	−1.3	−1.1
1981	108.0	86	125.58			125.2	2.9	2.3
1982	108.9	84	129.64			129.7	0.9	0.7
1983	109.8	80	137.25			136.8	0.9	0.7

Sources: Unfinished capacity from *Nar. khoz. SSSR*, various editions; investment from Clarke, 1972, pp. 12–13 and *Nar. khoz. SSSR*, various editions.

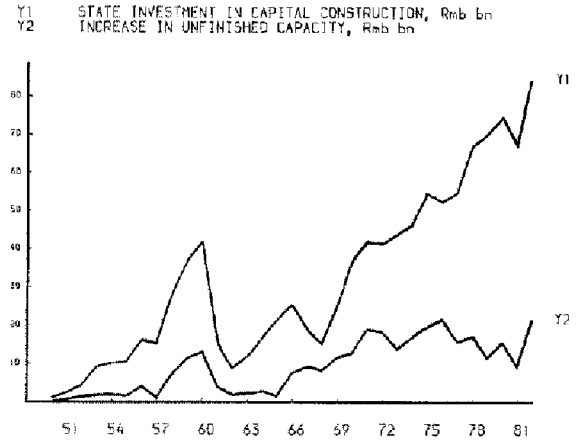


Figure 1. Investment and unfinished capacity in China (1) 1950–82

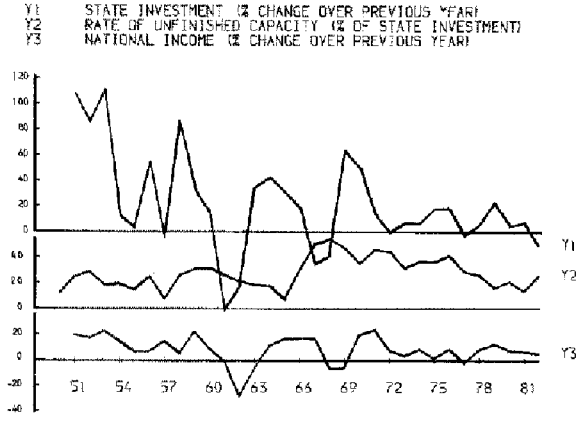


Figure 2. Investment and unfinished capacity in China (2) 1950–82

income. A high growth rate of state investment is taken to indicate both the extent to which investment mobilization generally pre-empts new resources, and also the extent to which new investment resources are embodied specifically in new capital projects which disproportionately increase the volume of unfinished capacity. A high growth rate of national income is taken to be both a condition for and a result of a high rate of investment completion.

(a) The first Five Year Plan (1953–7) In this period investment rose strongly — and so did unfinished capacity. At first the rate of unfinished capacity was kept well under control. But national income growth dropped sharply. The investment mobilization peaked in 1956 and was followed by downward revisions in plan targets, allowing the increase in unfinished capacity to be virtually halted in 1957, in spite of more modest output growth.

(b) The Great Leap Forward (1958–60) The breathing space of 1957 was shortlived. It was followed by a unique investment surge. Capital resources were poured into irrigation and flood control projects, rural industrialization and other new plant. The peak value of the accumulation fund's share of national income was 44 per cent — surely unique for a major economy in peacetime. At first there was a similar, unprecedented acceleration of national income. But the acceleration was achieved to a large extent by pressing on existing capacity limits in both industry and agriculture. Floods, harvest failures and the abrupt cessation of capital imports from the Soviet Union further complicated the picture. While unfinished capacity mounted, output expansion was halted and put into reverse. The rate of unfinished capacity rose to over 30 per cent. After 1960 the investment mobilization collapsed.

(c) Adjustment and recovery (1961–5) The economic decline originating in the Great Leap Forward could not be quickly reversed. Investment was cut back, and the rate of unfinished capacity fell, but national income continued to fall too. Recovery began in 1963. With recovery the investment effort mounted again, but unfinished capacity was kept strictly under control.

(d) The Cultural Revolution (1966–76) Such was the turmoil of the first years of Cultural Revolution that in 1967–8 investment fell sharply, while accumulation's share of national income was sharply reduced. Yet unfinished capacity mounted, and continued to mount at a high rate. The rate of unfinished capacity reached absurd levels — 54 per cent in 1968. But in 1969 a new investment mobilization was launched; given substantial excess capacity in Chinese industry after the preceding two years' output decline, and the large backlog of uncompleted construction, conditions were favourable for rapid expansion of finished capacity and output. Even so the rate of unfinished capacity declined only slowly and unevenly, and the investment mobilization continued to add to unfinished capacity in volumes reminiscent of the Great Leap Forward. The investment surge begun in 1969 was broadly sustained until 1976, but with a downturn in 1971–2 when the rate of unfinished capacity again rose sharply. After 1972 investment mobilization was resumed but the results were extremely disappointing in terms of output expansion. It came to an end as the political struggle over Mao Zedong's decline and death intensified in 1976.

(e) Adjustment and reform (1976–) After the struggle against the Gang of Four another investment mobilization was launched; at first unfinished capacity was actually reduced, and output responded rapidly. But renewed deterioration in 1979–80 provided part of the context for a more decisive turn against the old-style Maoists and the emergence of a new leadership under Deng Xiaoping. The political transition was marked by a momentary relaxation, then a new investment surge in which unfinished capacity once again grew at a high rate.[11] The economic reform process had in fact already begun, with the 1981 transition from the people's commune to the responsibility system in agriculture, and a decentralization of investment controls in industry in 1979–82. But in spite of the new moderation of leadership, expansion drive still operated strongly in industrial management.

Soviet interwar experience

Figure 3 graphs Soviet data for state investment (1928–40) and the increase in unfinished construction (1928–37, two overlapping series). Figure 4 shows the rate of unfinished capacity calculated from these data in comparison with the annual growth rates of state investment and national income. These figures illustrate the main episodes of Soviet interwar experience.

(a) The first Five Year Plan (1928–32) Investment mounted rapidly, and so did unfinished capacity — in fact, more than in proportion. By 1931–2 between a fifth and a

[11] Subsequently the revival of investment mobilization was condemned and set in reverse; see Xue, 1982, pp. 13–14.

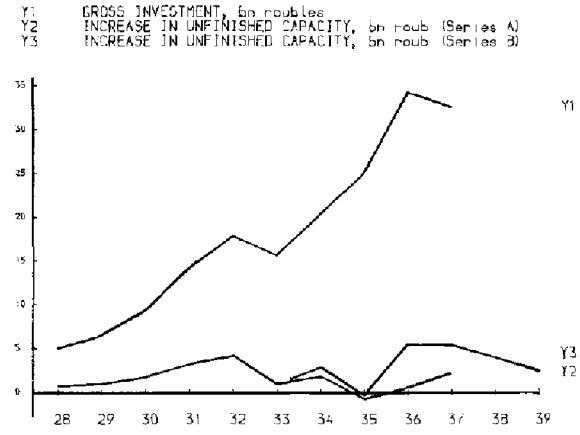


Figure 3. Investment and unfinished capacity in the USSR (1) 1928–39

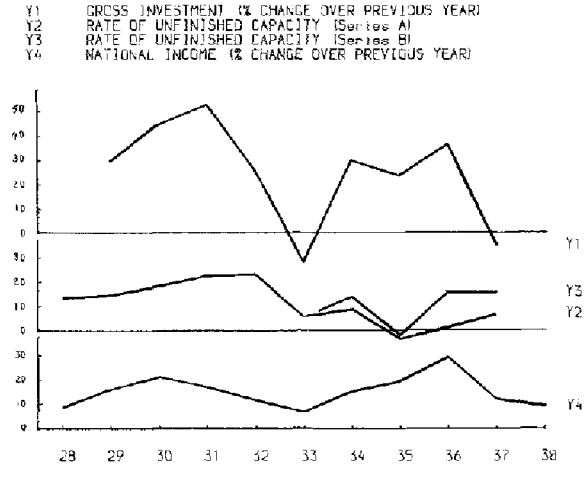


Figure 4. Investment and unfinished capacity in the USSR (2) 1928–38

quarter of Soviet investment was being poured into unfinished projects. But by 1930 a progressive collapse of Soviet agriculture was on the way, intensifying in 1931–2. By 1932 the Soviet import of plant and machinery was also moving into a state of collapse, as export revenues dwindled and the supply of credit dried up. National income growth slowed right down. The investment mobilization peaked in 1932.

(b) Adjustment and renewed mobilization (1933–6) In 1933 investment fell, while the completion of new capacity was accelerated. A new Five Year Plan (the second, covering 1933–7) had been drafted with revised, more moderate expansion targets. By 1934 the basis had been laid for a resumption of the mobilization drive. Investment mounted again and, on the basis of rapid completion of projects initiated under the first Five Year Plan, national income and industrial production once again began to multiply. Initial success is reflected in the fact that in 1934 the increase in unfinished capacity was strictly controlled,

while in 1935 the backlog actually fell. The investment mobilization peaked in 1936. Our view of that year is to some extent conditioned by our choice between the two available series for unfinished construction. Series B probably has more complete coverage and may well be more credible. This series shows a large increase in both the level and rate of unfinished construction in 1936. This was also a year of resumed rapid Soviet rearmament, so we would expect to find a large number of new defence projects being started simultaneously, and it would not be surprising to find that they were omitted from Series A. However this is all speculation. What is undisputed is that after 1936 the Soviet economy moved into a much more difficult period.

(c) Stagnation and limited recovery (1937–40) The overinvestment crisis, complicated not only by rearmament but also by administrative instability and intense purges, proved extremely difficult to reverse. Although investment was lower in both 1937 and 1938 than in 1936, the rate of addition to unfinished capacity remained high. Only in 1939 did investment exceed its previous peak, but by this stage we have passed the limits of published data on unfinished capacity. We know, however, that by late 1940 a new output mobilization was gathering pace.

(d) China's Great Leap Forward and the Soviet first Five Year Plan compared These two great investment mobilizations had much in common. Each was born out of a conviction that existing methods of planning and resource allocation were insufficiently ambitious and left untapped a great concealed reserve of productive potential. Each involved the mass mobilization of millions of workers and peasants for great capital projects, and transformed the whole country into a gigantic building site within a handful of years. Each resulted in a radical reconstruction of both industrial management and the agrarian system. Each was dogged by unforeseen adverse circumstances — severe climatic fluctuations which prejudiced agricultural goals, an unexpected severing of foreign trade ties curtailing the large-scale import of plant and machinery, and external military threats. Each ended in exhaustion.

The differences between these two phases are also striking. China's Great Leap Forward was a more radical experiment. China's initial level of economic development (measured by both national income and food availability per head) was lower than that of the Soviet Union on the eve of the Soviet first Five Year Plan. China had already developed the outlines of an economic system of the Soviet type, and had already undergone a first investment mobilization under her own first Five Year Plan. The replacement of industrial management by revolutionary committees, and the emergence of the people's commune in the countryside, amounted to a more far-reaching reconstruction of the economic system than anything in Soviet experience. China's rate of accumulation as a share of national income, her initiation of new investment projects, and her expansion of output in the initial moments of the Great Leap Forward, far exceeded the Soviet record. By the end of the investment mobilization both countries had experienced a severe contraction of agricultural output by up to one third, and famine conditions obtained in many regions. But in the Soviet Union industrial production merely marked time for a brief period, whereas in China industrial production fell back to the level achieved before the Great Leap Forward.

In both countries the investment mobilization was followed by a degree of relaxation and adjustment. The adjustment was eased in so far as each country now possessed a backlog of unfinished capacity which, upon completion, would add substantially to employment and output in the coming period. In the Soviet Union the adjustment period was brief and the relaxation short-lived. Official opinion held that the experience of the first Five Year Plan had been a success on balance. Investment mobilization was shortly resumed. But in China the adjustment period following the Great Leap Forward was longer, and the struggle over its meaning and significance for the future was more open. Mao's victory over his opponents in 1966–7 led the way to a new phase in investment mobilization which was even more radical and far-reaching than the Great Leap Forward in both quantitative and institutional terms. In China the second investment mobilization was preceded by a settling

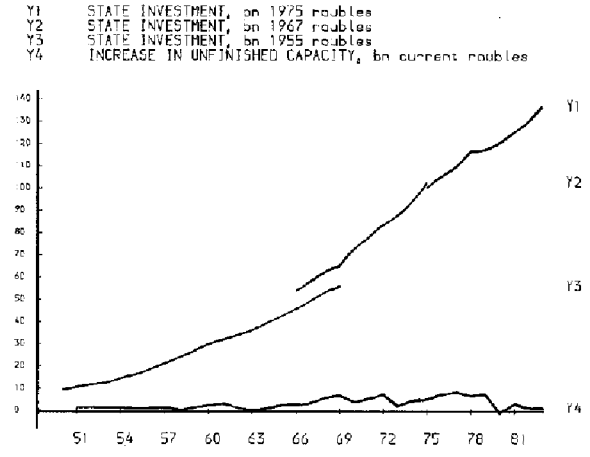


Figure 5. Investment and unfinished capacity in the USSR (1) 1950–83.

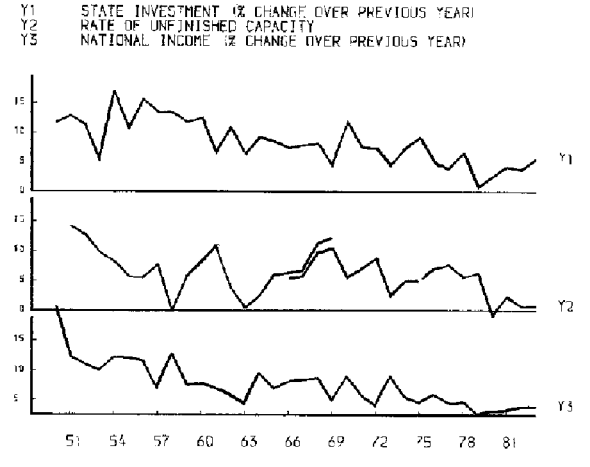


Figure 6. Investment and unfinished capacity in the USSR (2) 1950–83.

of accounts with the critics of the first, whereas in the Soviet Union the settling of accounts came a year or so later.

The postwar Soviet record

Figure 5 graphs Soviet data for state investment and the increase in unfinished capacity. As mentioned previously, the increase in unfinished capacity is measured at current prices, while state investment is shown in three overlapping series measured at constant 1955, 1967 and 1975 prices respectively. Figure 6 shows associated rates of unfinished capacity and growth rates of investment and national income. These figures illustrate four main phases of postwar Soviet investment experience.

(a) Postwar reconstruction (to 1952) In this period the Soviet economy was mobilized to restore the war damage to towns, industries and farms, transport links and social infrastructure. Much of the investment was equilibrating, in that it enabled the utilization of existing plant and the commissioning of new capacity to grow rapidly. Once defence production had been run down, industrial output expanded at rates often exceeding 20 per cent per year. At the same time, new long-term projects were initiated. The most famous of the latter, the Stalin plan for the transformation of nature, evisaged an extending list of capital projects for afforestation, irrigation, water control, canal construction and hydroelectric power. These were to be carried out over several five-year periods, and the recoupment period was also to be very long. The mobilization of resources for these and similar projects was begun but not carried through, and by 1952 their mention had been quietly dropped.[12] Their influence upon realized investment mobilization and capacity completion is hard to judge. The incomplete data available suggest that by 1951–2 the rate of unfinished capacity stood at 14 per cent and was falling. Fourteen per cent would prove to be a post-war high; but by prewar standards the increase in unfinished capacity was being strictly controlled.

(b) Mobilization and retardation I (1953–63) Unlike the Chinese case, short term Soviet economic performance was little affected by leadership struggles. In the long term, the post-Stalin period saw progressive economic retardation. In 1954–60 there was a prolonged investment surge; for most of this period the rate of unfinished capacity was held down to 5 per cent (in 1958 unfinished capacity actually fell), but eventually the investment mobilization culminated in a sudden rise of the rate, which peaked at over 10 per cent in 1961. Results of the investment mobilization in terms of output growth were uneven, and increasingly disappointing. After 1960 investment growth slowed down, and by 1963 the increase in unfinished capacity had once more been almost eliminated. But there was no restoration of output growth, which fell to a record low — an important factor in Kruschev's dismissal in 1964 and the following burst of economic reform-mindedness.

(c) Mobilization and retardation II (1964–79) In the Brezhnev period there were several minor investment cycles, starting in 1964–8 with another sustained investment mobilization. At first output growth was restored, but the rate of unfinished capacity climbed too, reaching a high of 10.4/12.2 per cent in 1969. From now on economic retardation asserted itself more and more strongly. From year to year national income growth continued to move inversely with the rate of unfinished capacity — but over the long term, in spite of continued significant investment growth and ever more strenuous limitation of the increase in unfinished capacity output expansion was not maintained. By 1979 growth had almost ceased — an unprecedented position for the Soviet economy in peacetime.

(d) Adjustment and renewed mobilization? (1980–) With investment reined back, unfinished capacity also stopped growing. In 1980 economic growth was renewed, although at historically low levels. Investment grew again, at modest rates; almost all of investment added to new capacity.

(e) Secular trends in Soviet postwar experience Three main conclusions may be drawn from the foregoing analysis. First of all, the rate of unfinished capacity was usually lower in postwar experience than between the wars. This may have been the result partly of a lower investment growth rate, partly of better control of the investment process resulting in less extreme investment cycles. Secondly, the rate of unfinished capacity itself fluctuated within much narrower limits than in the interwar years, and was less clearly associated with changes in the rate of investment, although prolonged mobilization still tended to culminate in sudden increases in the rate of unfinished capacity.

Thirdly, within the postwar period the rate of unfinished capacity tended to decline (a small part of the measured decline is due to the revaluation of Soviet investment in 1969, but the rest of the decline is real). Postwar decline in the rate of unfinished capacity may

[12] Zaleski, 1980, pp. 386–95.

again be explained in part by a decline in the growth rate of investment from 10–15 per cent annually in the 1950s to 5–10 per cent in the 1960s and 1970s and 5 per cent or less in the 1980s (in part, also, by more sophisticated investment criteria and controls). Is there some connection between Soviet economic retardation and the backlog of unfinished capacity? It is not that failure to complete capital projects has caused output growth to decline. The true inference runs in the reverse direction. The slowdown in investment growth has allowed the rate of unfinished capacity to fall, although the volume of Soviet investment and its weight in Soviet national income remain enormous, and the Soviet economy continues to undertake many more large-scale, long-term capital projects than ever before.

The implication seems to be that the rate of unfinished capacity is no longer a vital indicator of Soviet investment performance. Why then do Soviet leaders continue to express grave concern over the problem of unfinished construction?

Unfinished construction is still a problem for Soviet decision makers, but the reason has changed. Stalinist investment policy was characterized by 'project orientation' — that is, a perception of the modernization process as one of building huge new towns, power stations, railway networks, steel mills and engineering works which would cumulatively transform the country. This vision rested on a belief in the inexhaustible reserves of the Soviet people. But in reality the reserves were not inexhaustible, and the behaviour of unfinished construction was one result of the clash between beliefs and realities. Today, Soviet investment policy places more stress on 'process rationalization', while project orientation has been downgraded. Process rationalization means raising the technical level and capacity of existing plant, rather than constantly multiplying their number. And this is just a logical response to the reality that for many years Soviet reserves of labour and non-labour variable inputs have been stretched to the limit.

Of course, project orientation and process rationalization are not exclusive opposites. Within the Stalin period there were many phases when technical improvement and 'mastery of technique' were given more emphasis than initiating new capital projects. In the same way, although process rationalization is recognized by a broad consensus of official opinion to be the key to development of the post-Stalin Soviet economy, there are today preserved powerful tendencies which nonetheless seek to solve immediate problems by initiating grand new designs — for example, by new transformations of the frozen Siberian wastes, or of the Central Asian desert.

Thus in the Stalinist economic system the backlog of unfinished construction was perceived as the failure of capital projects essential to industrial modernization. Today, the much larger but less rapidly expanding backlog is perceived as an entirely different problem — the failure to prevent the initiation of new projects on a scale which disrupts the course of industrial modernization and diverts effort away from real tasks.

Conclusions

The rate of unfinished capacity measures the proportion in which new investment adds to the stock of incomplete capital projects, rather than to the stock of finished, operating capacity. In a 'shortage' economy the rate of unfinished capacity should be a useful indicator of fluctuations in the effectiveness of investment, and of proportionality in the investment process. In a growing economy the rate of unfinished capacity will usually be positive, but sudden increases may indicate a tendency towards overinvestment. Both Soviet and Chinese statistics allow the measurement of additions to unfinished capacity over long periods of time. Chinese data appear to be more problem-free; Soviet interwar data suffer from coverage problems, while Soviet postwar data suffer from a range of methodological defects, including inconsistent standards of valuation and inappropriate definition of the index of proportionality of unfinished capacity to investment. After allowing for these problems, a number of findings emerge. The rate of unfinished capacity is a useful index of overinvestment in the interwar Soviet and postwar Chinese economies.

Overinvestment has been more serious in Chinese than in Soviet experience. In the postwar Soviet economy the rate of unfinished capacity has tended to decline, and has become less important over time as a cyclical indicator of the effectiveness of investment. However, in facing the challenge of 'intensive' growth, the Soviet economy continues to find the control of unfinished capacity a difficult problem.

Appendix: Alternative indices of capacity completion

In Figure A-1 we compare the estimated Soviet rate of unfinished capacity, $\bar{u}_t$, with the officially defined Soviet rate of total unfinished capacity, $\bar{s}_t$ (both defined in the text above). There is an evident lack of association between their year-to-year movements, particularly until the mid-1960s. Nor is there any clear link between their long-term movements.

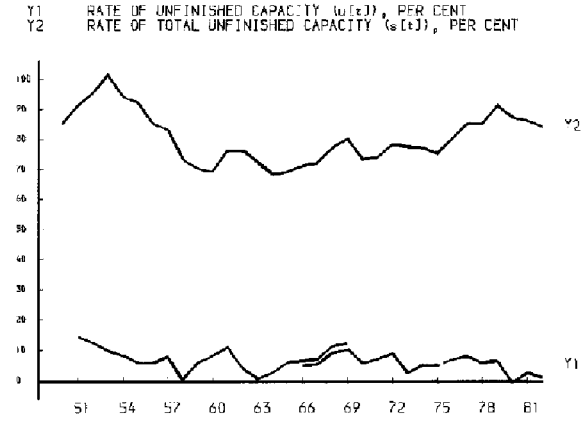


Figure A-1. Alternative Soviet unfinished capacity rates, 1950–83.

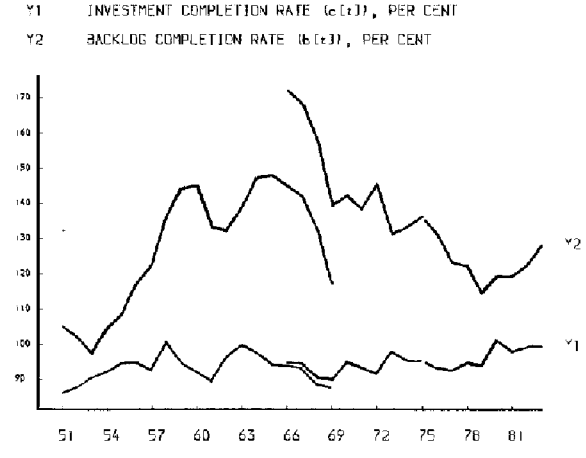


Figure A-2. Alternative Soviet capacity completion rates, 1951–83.

In Figure A-2 we compare the estimated Soviet investment completion rate, $\bar{c}_t$ (which is simply the complement of the rate of unfinished capacity), with the estimated Soviet backlog completion rate, b_t (defined in the text above). As expected, annual changes in backlog completion tend to lag behind annual changes in investment completion. Of great interest is the long-term rise in backlog completion until the early 1960s, when investment growth was held at a high level and investment completion tended to improve; and the subsequent long-term decline in backlog completion as investment fell, in spite of the continued high rate of investment completion.

Our interpretation of Figure A-2 confirms our earlier conclusion: the backlog completion rate is a less accurate guide to the investment cycle than the investment completion rate, but is more useful as a measure of long-term changes in investment efficiency.

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