Scrap Rates

Economy-wide scrap rates could be estimated if economy-wide original values of fixed assets and investment data were available, but they are not. Therefore, scrap rates are estimated based on subsets of the whole economy where the necessary data to do so are available. Scrap rates can be calculated from two independent combinations of the accounting identities presented in the paper.

Depreciation-based scrap rates

One way to calculate scrap rates is to make use of depreciation rates. With cumulative depreciation from equation (1) and depreciation from equation (5), scrap values (the *original* value of decommissioned fixed assets) follow in equation (4); scrap rates are obtained by inserting the scrap value in equation (3). Solving the four equations for the "depreciation-based" scrap rate (and the unknown revaluation term) yields

$$\text{scrap rate}_t - (\alpha * \text{revaluation}_t / \text{OFA}_{t-1}) =$$

$$(\text{OFA}_{t-1} - \text{OFA}_t + \text{NFA}_t - \text{NFA}_{t-1} + (\text{depr. rate}_t * (\text{OFA}_t + \text{OFA}_{t-1})/2)) / \text{OFA}_{t-1}. \quad (9)$$

For budgetary SOEs and all industrial SOEs, the two time series original values of fixed assets and net fixed assets are available with values for all three series simultaneously in the years 1953-98/ 1953-2003; for SOUs they can be approximated for 1953-98. Depreciation rates of budgetary SOEs are those in the first column of the table in the paper (with guesstimates for 1993-98 of 6.6, 6.5, 6.3, 5.7, 5.1, and 5.8%); depreciation rates of industrial SOEs are those of budgetary industrial SOEs in the second column; depreciation rates of SOUs are those of budgetary SOEs through 1977, and the approximate economy-wide ones since 1978. Table 1 has the resulting scrap rates. For the underlying fixed asset data see Table 2, for the depreciation rates see the paper. For SOUs, the fixed asset values are assumed to be proportional to those of budgetary SOEs (see notes to Table 2).

Ideally, the depreciation rates used in equation (9) are "calculated" ones because they are paired with the original value of all fixed assets (including those already fully depreciated but not yet decommissioned).[1] But for the years prior to 1985 no calculated depreciation rates are available. Combining reported official rates for some years with calculated ones for other years would involve a statistical break. Adjusting all reported official rates downward is an option, but the adjustments in the years prior to 1985 would be somewhat arbitrary. Given the way the depreciation rate enters equation (9), the impact of using reported official rather than (unavailable) calculated rates is likely to be minor. The resulting scrap rate is slightly biased upward; this is confirmed by the SOU case, where reform period scrap rates are the approximate (calculated) economy-wide ones.

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[1] The *calculated* depreciation rate (depreciation divided by the original value of fixed assets) is lower than the true average depreciation rate because the calculation relates 'depreciation on those fixed assets not yet fully depreciated' to 'all fixed assets (including those already fully depreciated).' This is necessitated by the fact that the value of fixed assets already fully depreciated is unknown. The resulting depreciation rate, calculated from a subset of the economy, is appropriate when it is in the following related to the published official original value of fixed assets (which include fixed assets which have already been fully depreciated).

Figure 1 charts the depreciation-based scrap rates for the three different groups. All three series follow the same pattern over time and exhibit similar average rates over periods of several years. Between 1955 and 1992, i.e., excluding the 1953 and 1954 negative scrap values, the average annual budgetary SOE scrap rate is 0.87 %. That of industrial SOEs in this period is 1.14%. SOU scrap rates are identical to those of budgetary SOEs through 1977 due to the assumptions, and very similar thereafter, with an average annual 0.73% between 1955 and 1992. The coefficient of variation of SOEs and industrial SOEs in 1955 through 1992 is 0.79 and 0.48, reflecting a rather tight band of values over time, which in turn suggests a combination of steady investment growth and inflation. With revaluation occurring in some of the years since 1993, later values are not included in these calculations of long-run averages.

The scrap rates in the period 1993 through 2003 reflect actual scrapping but also revaluation because the scrap rates here are calculated as the right-hand side values of equation 7). The negative values in 1994 and 1995 suggest a corresponding positive revaluation, the large positive value in 1999 a negative revaluation (or relatively high scrap rate). A statistical break, explained below, occurs between 1997 and 1998.

Investment-based scrap rates

Scrap rates can also be obtained based on effective investment. The values of effective investment together with the original values of fixed assets immediately yield scrap rates in equation (2'), which can be solved for the scrap rate (and the unknown revaluation term) as

$$\text{scrap rate}_t - (\text{revaluation}_t / \text{OFA}_{t-1}) = (\text{investment}_t + \text{OFA}_{t-1} - \text{OFA}_t) / \text{OFA}_{t-1}. \tag{10}$$

The term "investment" in the equation is effective investment. Effective investment data are available or can be constructed for industrial SOEs for all years in the period 1953-2003 except 1966-74, and for SOUs are available for all years. Table 1 has the results. For the underlying industrial SOE fixed asset data and investment see Table 2, for the (SOU) transfer rate to turn investment into effective investment see the paper or the appendix on investment data; SOU investment values are also provided in the paper and in the appendix on investment data.

Figure 2 shows that the resulting two scrap rate series exhibit the same pattern over time, but are significantly lower than those obtained via depreciation rates. More than half of all values are negative. The average scrap rate for SOUs in 1953-1992 is negative 0.67% (negative 0.77% for 1955-92), and for industrial SOEs in 1981-1992 (with consistent data from one source) negative 0.16% or in 1953-1992 (with no data for 1965-74) positive 0.68%. The range of values over time is significantly larger for investment-based than for depreciation-based scrap rates; the range in the vertical scale of Figure 2 is about twice that of Figure 1 on the positive side, and five times on the negative side. The investment-based industrial SOE scrap rates also show large positive revaluations in 1994 and 1995, as the depreciation-based scrap rates do, and, in addition, in 1993.

Statistical break 1997-98

A statistical break occurs between 1997 and 1998. The coverage of fixed asset values after 1997 switches from industrial "SOEs" to industrial "SOEs and state-controlled enterprises." In the case of the depreciation-based scrap rates, this implies a statistical break. In the case of the investment-based scrap rates, this implies inconsistent scrap rates since 1998 because the coverage of the investment variable does not change but remains the "SOEs." (The scrap rate in the investment-based case combines fixed asset and effective investment data.)

Revaluations

The depreciation-based and investment-based scrap rates in the years after 1992 are likely to incorporate revaluations. The solution is the following. First, by the year 2000 revaluations are likely to be small, occurring if at all only in the process of changes to the organizational form of individual enterprises. The depreciation-based scrap rates of 2000-03, thus, are likely to be accurate.[2] Connecting the reliable 1992 and an approximate 2003 depreciation-based scrap rate of 2.5% through linear interpolation yields alternative depreciation-based scrap rates for 1993-2003 (also reported in Table 1).[3] Second, by 2003 the official investment data should be highly complete, which implies that the investment- and the depreciation-based scrap rates should be near-identical. Consequently, the 2003 investment-based scrap rate is assumed to be identical to the approximate depreciation-based scrap rate, and investment-based scrap rates for the years 1993 through 2002 are obtained through linear interpolation.[4]

Constant scrap rate of 0% or 1%

Constant long-run scrap rate scenarios of 0% and 1% are a rough approximation of (and alternative to) the investment-based and depreciation-based scrap rates. A scrap rate of 0% can also be justified as follows. If the SOU benchmark original value of fixed assets for 1980 (or 1981, or 1982) and that for 1992 (or 1991) are combined with the official data on SOU effective investment in equation (2'), the result is an average annual scrap rate of between negative 1.11% and negative 1.23%; even if the data on newly increased fixed assets of 1981 through 1985 are augmented by the ratio of gross fixed capital formation to total investment (Figure 1 in the paper), the average annual scrap rate remains negative at 0.87% (1980-92). Alternatively, the official data on newly increased fixed assets could be underestimates even

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[2]   The original 1992 depreciation-based scrap rate is that of budgetary SOEs, in later years it is that of industrial SOEs. The cross-over is needed due to limited data availability for each group individually. In 1992, the two values for budgetary SOEs and industrial SOEs are 0.0130 and 0.0144 which seems reasonably close to allow the cross-over from a 1992 budgetary SOE scrap rate to a 2003 industrial SOE scrap rate. (There is a similarly close match between the two series in earlier years. The 1993 values, presumably already incorporating some revaluation, for the two ownership groups are 0.0048 and 0.0046. For the complete, individual time series see the appendix on scrap rates.)

[3]   The most recent scrap rates (equation 9) are based on various fixed asset values which all incorporate past revaluations. As long as no revaluation occurs in the current year, past revaluations do not affect the resulting scrap rate (a simple simulation shows that the scrap rate is the same as if no revaluation had happened). The calculated depreciation-based scrap rate of 2003 is 3.24%, which appears too high given past trends, too high in comparison to the year 2000 and 2001 values, and too high in comparison to the average values of 1996 or 1997-2002. Furthermore, the scrap rate series is, if anything, biased upward (see note in paper). The average of 2000-03 is 2.87% which led to the adoption of a 2.5% scrap rate for 2003 as basis for the linear interpolations 1993-2002.

[4]   The original investment-based 2003 scrap rate cannot be identical to the depreciation-based one because of the statistical break and inconsistent investment-based scrap rates since 1998.

after 1985, the benchmark values of the early 1980s could be underestimates, or the benchmark values of the early 1990s could be overestimates. For the five benchmark values see the appendix on fixed asset data.

Implicit vs. actual effective investment

A negative investment-based scrap rate throughout much of the pre-reform period is not plausible; there is no evidence of revaluations in the pre-reform period and the fixed asset data are rather reliable. This then suggests that the investment data are too small. If effective investment were larger each year by 14%, the average annual scrap rate of SOUs in 1955 (rather than 1953, to compare to the depreciation-based scrap rates) through 1992 would be positive 0.73% (rather than negative 0.77%), identical to the average annual depreciation-based scrap rate. In the case of industrial SOEs in 1981-1992, such an upward adjustment of effective investment (by 14% each year) would yield an average annual scrap rate of positive 1.60% (rather than negative 0.16%), compared to an average annual depreciation-based scrap rate of 1.46%; in 1953-1992 (with no data for 1965-74) it would yield a scrap rate of 2.69% (rather than 0.68%), compared to the average annual depreciation-based scrap rate of 0.94% for exactly the same years. In other words, if depreciation rates were accurate, effective investment of SOUs underestimates actual such effective investment each year by around 14%, and similarly for industrial SOEs in 1981-92.

Figure 3 makes the same point differently. The depreciation-based scrap rate yields an implicit effective investment value if the scrap value in equation (2'):

$$\text{implicit investment}_t + \text{revaluation}_t = OFA_t - (1 - \text{scrap rate}_t)\, OFA_{t-1}.$$

Figure 3 reports the ratio of these implicit values to the actual effective investment values (which underlie the investment-based scrap rates). While there is a good match between the two values in the mid-1980s, in the 1950s the ratio is below unity, and otherwise, as a rule, above unity. The 1990s data are likely to reflect positive revaluations (which affect the implicit but not the actual value) in the years 1993-95 and then the consequences of the statistical break in the fixed asset series in the years since 1998 (the implicit effective investment values starting in 1998 reflect a broader, new coverage of enterprises, while the actual values retain the narrower, old coverage).

If depreciation rates were accurate, the positive outlier ratios of 1962, 1968, 1971-72, and 1976, all above 1.6, suggest significant underreporting of actual effective investment in the official statistics. On the other hand, if the effective investment data were correct, then depreciation rates need to be adjusted downward. A 0.5 percentage point reduction in the depreciation rate lowers the ratio of effective to actual investment in the case of SOUs, between 1953 and 1992, by on average only 0.0614 every year. A reduction in the depreciation rate by 1.8 percentage points would bring the average annual ratio between 1953 and 1992 down to unity (1.0003). That would imply a depreciation rate of around 2% or less for most of the pre-reform period, which does not appear plausible given the depreciation periods listed in the accounting regulations.[5] This, then, again suggests that effective investment data are too small.

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[5] The depreciation rates for SOUs implicit in the effective investment data (investment-based scrap rates), across decade intervals, are 5.74% for 1953-60, 1.95% for 1961-70, 0.18% for 1971-80, 2.68% for 1981-90, and 1.88% for 1991-2000.

Viewed yet differently, if effective investment values in the subsets of the economy from which investment-based scrap rates are derived were an underestimate, then these investment values in equation (10) are too small. The true investment value in equation (10) then equals the available investment value plus an unknown amount of investment. Abstracting from revaluations, equation (10) then reads

True scrap rate = $(\text{investment}_t + \text{OFA}_{t-1} - \text{OFA}_t) / \text{OFA}_{t-1}$ + unknown $\text{investment}_t / \text{OFA}_{t-1}$.

The first term on the right hand side is the derived investment-based scrap rate. If the depreciation-based scrap rate were correct, i.e., were the true scrap rate, then the unknown amount of investment can be obtained by subtracting the investment-based scrap rate from the depreciation-based scrap rate, and multiplying this difference by the previous-period original value of fixed assets.

At the economy-wide level, the scrap rate difference times the previous-period economy-wide value of original fixed assets yields the economy-wide unknown amount of effective investment. Relating it to the available economy-wide effective investment value yields a correction factor. In these calculations, the available economy-wide effective investment values can be the "B-C.4" or "B-C.3" combinations (non-SOU investment obtained following method 4 or method 3), with the corresponding original values of fixed assets obtained using the depreciation-based scrap rate (B-C.4) or the investment-based scrap rate (B-C.3).

The findings, shown in Figure 4, suggest that the available effective investment values are slightly too large in the 1950s, but otherwise too small. In 1962, unknown effective investment would appear to be equivalent to 50-60% of the available effective investment value, in 1968 40-50%, in 1971 more than 100%, and around 30% in the following years through 1978. Minor underestimation also occurs in the early 1990s, with a gradual decline to zero in 2003 when the two scrap rates are equal by design. (Scrap rates for the years after 1992 are the linearly interpolated ones.)

Table 1. Scrap Rates

	Depreciation-based					Investment-based			
	Budg. SOEs	SOUs	Ind. SOEs	Combined series	-> alter-native	Ind. SOEs	SOUs	Combined series	-> alter-native
1953	-0.0259	-0.0259	-0.0087	-0.0259		-0.0227	0.0411	-0.0227	
1954	-0.0158	-0.0158	-0.0239	-0.0158		-0.0653	-0.0166	-0.0653	
1955	0.0020	0.0020	-0.0034	0.0020		0.0401	0.0391	0.0401	
1956	-0.0053	-0.0053	0.0161	-0.0053		0.0801	0.0423	0.0801	
1957	0.0067	0.0067	0.0061	0.0067		0.0693	0.0590	0.0693	
1958	0.0016	0.0016	0.0144	0.0016		0.0993	0.0364	0.0993	
1959	-0.0104	-0.0104	0.0031	-0.0104		0.0363	-0.0501	0.0363	
1960	0.0050	0.0050	0.0040	0.0050		0.0338	0.0184	0.0338	
1961	-0.0024	-0.0024	0.0087	-0.0024		-0.0124	-0.0390	-0.0124	
1962	0.0146	0.0146	0.0095	0.0146		-0.0197	-0.0174	-0.0197	
1963	0.0073	0.0073	0.0134	0.0073		0.0160	-0.0010	0.0160	
1964	0.0079	0.0079	0.0134	0.0079		0.0074	0.0016	0.0074	
1965	0.0160	0.0160	0.0179	0.0160		0.0129	0.0409	0.0129	
1966	0.0125	0.0125	0.0133	0.0125			0.0116	0.0116	
1967	0.0078	0.0078	0.0094	0.0078			-0.0037	-0.0037	
1968	0.0140	0.0140	0.0175	0.0140			-0.0060	-0.0060	
1969	0.0103	0.0103	0.0133	0.0103			0.0002	0.0002	
1970	0.0018	0.0018	-0.0011	0.0018			-0.0245	-0.0245	
1971	-0.0064	-0.0064	0.0232	-0.0064			-0.1051	-0.1051	
1972	0.0087	0.0087	0.0097	0.0087			-0.0406	-0.0406	
1973	0.0080	0.0080	0.0034	0.0080			-0.0261	-0.0261	
1974	0.0073	0.0073	0.0109	0.0073			-0.0222	-0.0222	
1975	0.0067	0.0067	0.0070	0.0067		-0.0162	-0.0237	-0.0162	
1976	0.0090	0.0090	0.0155	0.0090		-0.0092	-0.0311	-0.0092	
1977	0.0084	0.0084	0.0066	0.0084		-0.0144	-0.0165	-0.0144	
1978	0.0083	0.0083	0.0096	0.0083		-0.0140	-0.0250	-0.0140	
1979	0.0036	0.0047	0.0061	0.0036		0.0043	-0.0024	0.0043	
1980	0.0089	0.0058	0.0107	0.0089		0.0055	-0.0068	0.0055	
1981	0.0097	0.0076	0.0123	0.0097		0.0028	-0.0168	0.0028	
1982	0.0126	0.0105	0.0106	0.0126		0.0016	-0.0113	0.0016	
1983	0.0152	0.0131	0.0126	0.0152		0.0055	-0.0138	0.0055	
1984	0.0194	0.0163	0.0128	0.0194		0.0168	0.0075	0.0168	
1985	0.0180	0.0149	0.0149	0.0180		-0.0296	0.0202	-0.0296	
1986	0.0184	0.0141	0.0165	0.0184		0.0189	0.0062	0.0189	
1987	0.0172	0.0129	0.0208	0.0172		0.0146	0.0053	0.0146	
1988	0.0131	0.0088	0.0153	0.0131		0.0130	-0.0152	0.0130	
1989	0.0105	0.0062	0.0147	0.0105		-0.0151	-0.0127	-0.0151	
1990	0.0171	0.0128	0.0158	0.0171		-0.0008	-0.0225	-0.0008	
1991	0.0144	0.0047	0.0142	0.0144		-0.0304	-0.0404	-0.0304	
1992	0.0130	0.0044	0.0144	0.0130	0.0130	-0.0166	-0.0090	-0.0166	-0.0128
1993	0.0048		0.0046	0.0046	0.0141	-0.0734	-0.0608	-0.0734	-0.0091
1994	-0.0364		-0.0151	-0.0151	0.0152	-0.0801	-0.1493	-0.0801	-0.0053
1995	-0.0144		-0.0198	-0.0198	0.0163	-0.2062	-0.1400	-0.2062	-0.0015
1996	0.0070		0.0172	0.0172	0.0173	-0.0047	-0.0406	-0.0047	0.0023
1997	0.0111		0.0090	0.0090	0.0184	0.0104	0.0246	0.0104	0.0061
1998	0.0255		-0.0395	-0.0395	0.0195	-0.1578	0.0761	-0.1578	0.0099
1999			0.0439	0.0439	0.0206	-0.0356		-0.0356	0.0136
2000			0.0211	0.0211	0.0217	-0.0106		-0.0106	0.0174

2001	0.0222	0.0222	0.0228	-0.0223	-0.0223	0.0212
2002	0.0391	0.0391	0.0239	0.0077	0.0077	0.0250
2003	0.0324	0.0324	0.0250	-0.0272	-0.0272	-0.0128

For fixed asset values and investment values see Table 2. Industrial SOE investment values are turned into effective investment using the SOU transfer rate (for the SOU transfer rate see the paper or the appendix on investment data). The SOU effective investment values are derived and explained in the appendix on investment data.

Depreciation rates are from the table with depreciation rates in the paper: depreciation rates of budgetary SOEs are those in the first column (with guesstimates for 1993-98 of 6.6, 6.5, 6.3, 5.7, 5.1, and 5.8%); depreciation rates of industrial SOEs are those of budgetary industrial SOEs in the second column; depreciation rates of SOUs are those of budgetary SOEs through 1977, and the approximate economy-wide ones since 1978.

The depreciation-based combined scrap rate series consists of the values of budgetary SOEs in 1952-92, and of those of industrial SOEs in 1993-03.

The investment-based combined scrap rate series consists of the values of SOUs in 1966-74, and of those of industrial SOEs otherwise (1953-65, 1975-2003).

Alternative series: the 1992 depreciation-based scrap rate value and the 1992 investment-based scrap rate value are interpolated linearly from 1993 through 2002 to both reach the approximate 2003 depreciation-based scrap rate value of 2.5%.

Sources for depreciation rates (depreciation rates are presented in a table in the paper with notes explaining their sources and construction): SOEs: official rates in *Fiscal Yearbook 1993*, p. 685 (for 1953-92, with linearly interpolated values for missing-year values 1958 and 1959 and guesstimates for 1993-98 of 6.6, 6.5, 6.3, 5.7, 5.1, and 5.8%); industrial SOEs: *Fiscal Yearbook 1993*, p. 685 (for 1953-92, with linearly interpolated values for missing-year values 1958 and 1959), *1994*, p. 435 (for 1993), approximations via provincial values from *1999*, p. 487, 489 (for 1994-98, as outlined in notes to table in the paper), and 1999 through 2003 values by assumption following the trend of related depreciation rates (see table in the paper and notes to the table); SOUs: SOE depreciation rates for 1953-77, and approximate economy-wide depreciation rates for 1978-1992 (table in the paper).

Table 2.   Fixed Asset and Investment Values Used in the Derivation of Scrap Rates (in 100m yuan RMB)

	Budg. SOE fixed assets		Industr. SOE fixed assets		Industrial SOE	
	original values	net values	original values	net values	capital constr.	invest-ment
1952	240.6	167.1	148.8	100.8		
1953	281.2	193.9	175.7	120.4	28.34	28.70
1954	342.0	240.6	219.5	151.9	38.37	39.77
1955	389.6	276.8	249.5	171.3	42.95	45.04
1956	454.7	325.9	282.8	197.7	68.20	70.64
1957	522.9	382.0	334.6	239.8	72.40	76.40
1958	644.2	484.9	435.6	330.6	173.00	179.47
1959	847.8	655.7	571.9	447.1	208.85	219.78
1960	1024.9	802.4	721.8	570.8	229.57	246.04
1961	1143.0	881.2	800.8	624.9	76.79	94.05
1962	1209.3	926.5	855.4	657.3	40.09	49.10
1963	1274.8	962.3	889.6	670.7	49.16	58.43
1964	1365.1	1020.4	951.7	709.7	72.06	82.95
1965	1445.8	1078.0	1040.0	777.2	88.96	107.43
1966	1549.7	1150.6	1120.0	828.9		
1967	1619.3	1184.7	1176.0	854.1		
1968	1675.8	1214.4	1229.0	884.4		
1969	1762.9	1265.5	1294.0	919.1		
1970	1967.7	1413.8	1462.0	1033.3		
1971	2327.2	1692.0	1610.0	1156.9		
1972	2576.1	1875.4	1806.9	1301.1		
1973	2845.8	2073.6	2033.6	1459.0		
1974	3106.3	2250.7	2196.1	1561.2		
1975	3414.3	2462.2	2428.3	1716.3	231.03	307.58
1976	3728.1	2678.2	2621.8	1846.4	208.73	290.52
1977	4052.9	2890.3	2882.2	2011.3	217.36	311.68
1978	4488.2	3201.4	3193.4	2225.7	273.16	364.61
1979	4892.5	3448.5	3466.7	2378.6	256.85	343.15
1980	5311.1	3701.7	3730.1	2528.0	275.61	367.83
1981	5769.2	3984.3	4032.3	2709.3	216.01	380.43
1982	6258.8	4299.9	4375.0	2914.0	260.60	467.43
1983	6833.3	4694.5	4767.8	3161.0	282.28	546.62
1984	7370.5	5051.8	5170.0	3395.5	341.59	653.52
1985	8004.9	5457.9	5956.2	3980.8	446.49	913.64
1986	9041.8	6224.5	6744.8	4543.8		1159.85
1987	10200.5	7067.3	7677.9	5242.4		1407.15
1988	11787.1	8237.7	8795.2	6040.4		1726.53
1989	13394.7	9339.4	10160.8	7033.2		1597.01
1990	15352.2	10835.9	11610.3	8088.3		1747.58
1991	17856.0	12647.8	13556.8	9507.2		2113.21
1992	20545.6	14513.0	15669.8	10982.7		2759.48
1993	25146.4	17704.4	19066.4	13304.4		3571.57
1994	33006.0	22754.7	23101.9	15677.5		3948.25
1995	42595.4	29504.8	30935.7	21363.9		4526.20
1996	50428.2	34995.9	34765.0	23860.7		4890.54
1997	56196.0	38585.3	38351.0	25883.0		4958.11
1998	59632.8	40093.3	47913.3	31429.8		4703.31

1999	53146.3	35735.1	4591.06
2000	57295.0	37638.8	4578.68
2001	61782.5	39588.2	4516.27
2002	64522.0	40762.7	4667.13
2003	69701.1	43667.3	5360.70

All fixed asset values since 1998 cover SOEs *and* state-controlled enterprises. In contrast, the investment data are likely to continue to cover only SOEs in the years 1998 and later.

The fixed asset values of industrial SOEs in 1952-57 (in the source) include public-private joint enterprises and private enterprises. Industrial SOE values cover all industrial SOEs, not only budgetary industrial SOEs.

Industrial SOE investment values of 1953-65 and 1975-80 are obtained as sum of (i) industrial SOE capital construction plus (ii) SOU technological updating and transformation times the ratio of industrial SOE capital construction to SOU capital construction. I.e., it is assumed that the share of (SOU) technological updating and transformation that occurs in *industrial* SOEs is equal to that in the case of capital construction. Values since 1981 are official industrial SOE values.

SOUs: The values of fixed assets and net fixed assets of SOUs are estimated by multiplying budgetary SOE fixed asset values with a constant factor of 1.4871. This factor is the five-year average multiplication factor of 1980-82 and 1991-92 implicit in the original value of fixed asset data of SOUs derived for these benchmark years (see appendix on fixed asset data) relative to the official (budgetary) SOE original value of fixed asset data of these years; the standard deviation is 0.0067, which implies a coefficient of variation of only 0.45%. The multiplication factor is used for the years 1953-1992, for both the original value of fixed assets and net fixed assets. The 1995 benchmark year implies a multiplication factor of 1.9128 based on the new (undefined) asset data or of 1.5578 based on the method used to obtain the benchmark values for 1980-82.

Sources:

Budgetary SOE fixed asset values (original and net values): *Fiscal Yearbook 1993*, p. 684 (for years through 1992) and *1999*, p. 481 (for years since 1993, with changed coverage since 1998 to include state-controlled enterprises but with all data now limited to industry, communication, and domestic trade).

Industrial SOE fixed asset values (original and net values): *Industrial Yearbook 1993*, p. 66 (1952-57 values include public-private joint enterprises and private enterprises); *2004*, p. 26 (with expanded coverage since 1998 to include state-controlled enterprises).

Industrial SOE capital construction 1953-65 and 1975-80: *Investment Materials 1950-85*, pp. 71-5. (*Investment Yearbook 1950-1995*, p. 102 has identical data on capital construction in industry as sum of light and heavy industry, plus two aggregate values for 1966-70 and 1971-74)

Industrial SOE investment: 1981-00: *Investment 1950-2000*: 42-7 (as sum of: mining and quarrying; manufacturing; production and supply of electricity, gas and water); 2001: *Statistical Yearbook 2002*, p. 180; 2002-03: *Statistical Yearbook 2004*, p. 192.
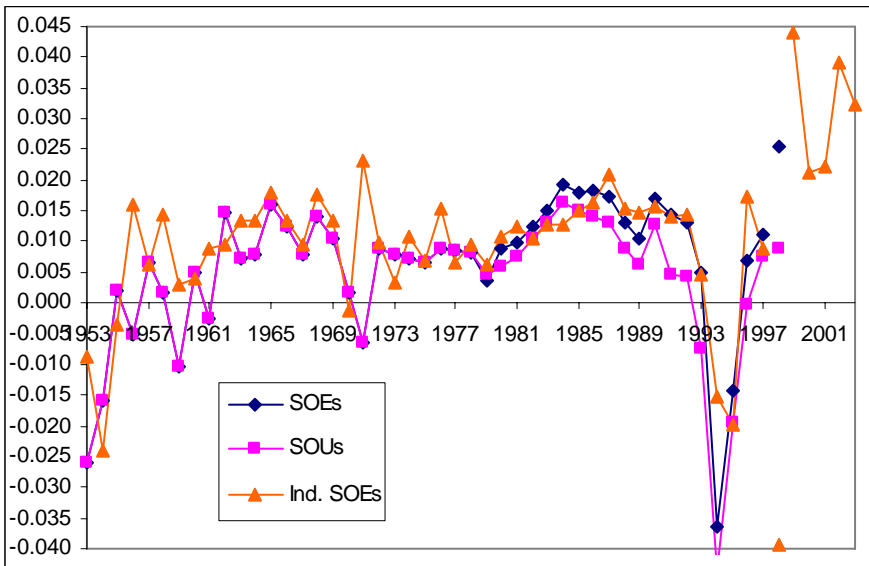
Scrap rates are obtained as follows: obtain cumulative depreciation from equation (1) and depreciation from equation (5), insert these two values in equation (4) to obtain scrap values, and obtain the scrap rate (including a revaluation component) from equation (3).

SOE and SOU values prior to 1979 are identical by construction (in the chart, the SOU markers overlay the SOE markers).

Sources: see Table 1.

**Figure 1.   Scrap Rates Based on Depreciation Rates, 1952-2003**
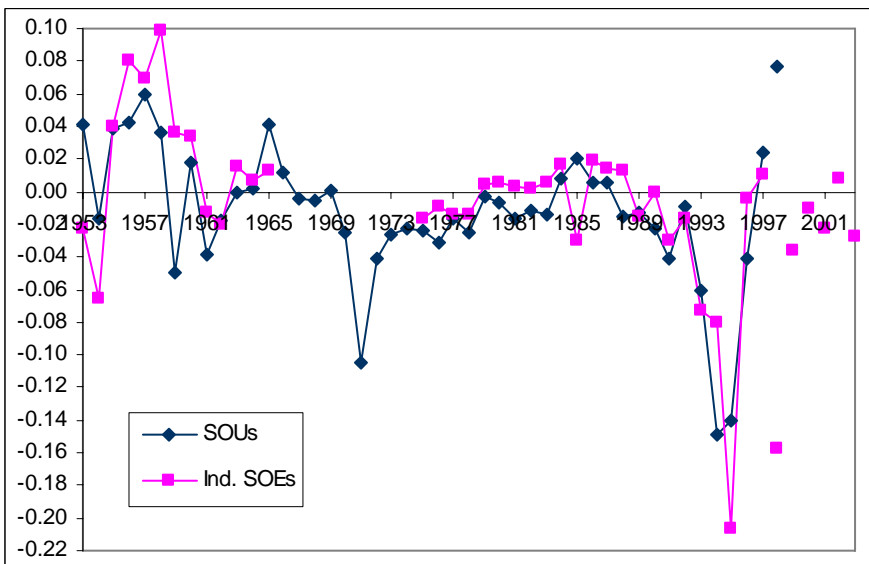
Scrap rates (including a revaluation component) are directly obtained from equation (2'), or indirectly by obtaining scrap values from equation (2) and inserting them into equation (3).

Fixed asset and investment values underlying the scrap rates since 1998 cover different enterprise groups, i.e., the scrap rates are no longer consistent.

Sources: see Table 1.

**Figure 2.   Scrap Rates Based on Effective Investment, 1953-2003**
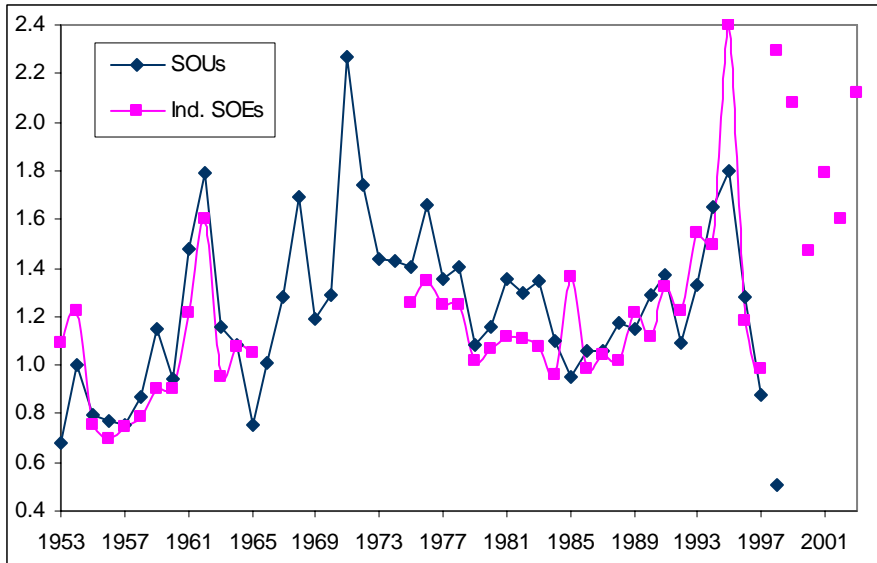
Implicit effective investment is obtained as follows as residual of equation (2').

In the derivation of implicit effective investment, revaluation is ignored throughout—revaluation is unlikely to have occurred prior to 1993—but may be a significant factor in the years starting 1993. Data since 1998 are inconsistent because the implicit investment has a new enterprise coverage whereas the actual effective investment data retain their old enterprise coverage.
Sources: actual effective investment: see Table 1.

Figure 3.   Ratio of Implicit to Actual Effective Investment
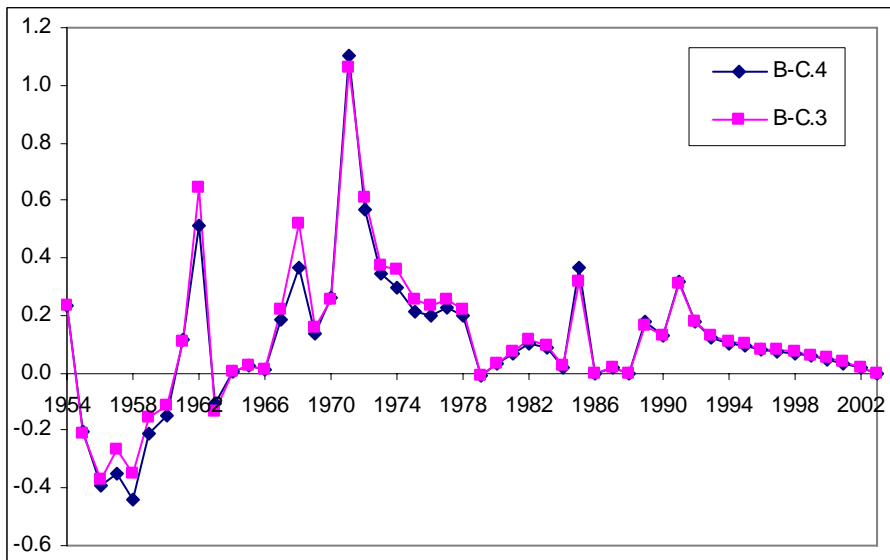
The adjustment factor is the ratio of estimated unreported effective investment to effective investment. Estimated unreported effective investment is obtained from equations (9) and (10) as difference of depreciation-based and investment-based scrap rates, multiplied by previous-period original value of fixed assets. "B-C.4" (B-.C.3) means non-SOU effective investment obtained following method 4 (3), and both SOU and this non-SOU effective investment turned into an original value of fixed asset series using depreciation-based (investment-based) scrap rates. "B-C.4" and "B-C.3" also refer to the effective investment values used to standardize the correction. Scrap rates for the years after 1992 are the linearly interpolated ones.

Figure 4.   Adjustment Factor for Effective Investment

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